CHAPTER 30

ICE AND RAIN PROTECTION

LIST OF EFFECTIVE PAGES

N, R or D indicates pages which are New, Revised or Deleted respectively.

Remove and insert the affected pages and complete the Record of Revisions and the Record of Temporary Revisions as necessary.

CHAPTER 30

ICE AND RAIN PROTECTION

LIST OF EFFECTIVE PAGES

N, R or D indicates pages which are New, Revised or Deleted respectively.

Remove and insert the affected pages and complete the Record of Revisions and the Record of Temporary Revisions as necessary.

CH/SE/SU	C	PAGE	DATE
S.B.LIST		1	Feb 28/79
S.B.LIST		2	Mar 27/97
S.B.LIST		3	Mar 31/99
S.B.LIST		4	Mar 31/99
T. of C.		1	Mar 31/00
T. of C.		2	Mar 31/00
T. of C.		3	Mar 31/00
T. of C.		4	Mar 31/00
T. of C.		5	Mar 31/00
T. of C.		6	Mar 31/00
T. of C.		7	Mar 31/00
T. of C.		8	Mar 31/00
T. of C.		9	Mar 31/00
T. of C.		10	Mar 31/00
T. of C.		11	Mar 31/00
T. of C.		12	Mar 31/00
T. of C.		13	Mar 31/00
30-00-00		1	May 30/81
30-00-00		2	Mar 31/99
30-00-00		3	Mar 31/99
30-00-00		401	May 30/76
30-00-00		402	May 30/76
30-00-00		403	May 30/76
30-00-00		404	May 30/76
30-00-00		405	May 30/76
30-00-00		406	May 30/76
30-00-00		407	May 30/76
30-00-00		408	May 30/79
30-00-00		409	May 30/79
30-00-00		410	May 30/79
30-00-00		411	May 30/79
30-00-00		412	May 30/79
30-00-00		413	May 30/79
30-00-00		414	May 30/79
30-00-00		415	May 30/79
30-00-00		416	May 30/79
30-00-00		417	May 30/76
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30-00-00		419	May 30/79
30-00-00		420	May 30/76
30-00-00		421	May 30/79
30-00-00		422	May 30/79
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30-11-00		10	Aug 30/77
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30-11-00		12	Aug 30/77
30-11-00		13	Aug 30/77
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30-11-00		15	Nov 30/78
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30-11-00		17	Aug 30/77
30-11-00		18	Aug 30/77
30-11-00		19	Aug 30/77
30-11-00		20	Aug 30/77
30-11-00		21	Mar 31/00
30-11-00		22	Mar 31/00

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
30-11-00		23	Mar 31/00	30-11-00		127	May 30/79
30-11-00		24	Mar 31/00	30-11-00		128	May 30/79
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30-11-00		26	Aug 30/77	30-11-00		130	May 30/79
30-11-00		27	Nov 30/78	30-11-00		131	May 30/79
30-11-00		28	Nov 30/78	30-11-00		132	May 30/79
30-11-00		29	Nov 30/78	30-11-00		133	May 30/79
30-11-00		30	Aug 30/77	30-11-00		134	May 30/79
30-11-00		31	Nov 30/78	30-11-00		135	May 30/79
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30-11-00		33	Nov 30/78	30-11-00		137	May 30/79
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30-11-00		125	May 30/79	30-11-00		174	Nov 30/79
30-11-00		126	May 30/79	30-11-00		175	Nov 30/79

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
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30-11-00		188	Nov 30/79	30-11-00		523	Nov 30/80
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30-11-00		190	Nov 30/79	30-11-00		525	Nov 30/80
30-11-00		191	Nov 30/79	30-11-00		526	Nov 30/80
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30-11-00		194	Nov 30/79	30-11-11		402	Aug 30/76
30-11-00		195	Nov 30/79	30-11-11		403	Aug 30/76
30-11-00		196	Nov 30/79	30-11-12		401	Feb 28/77
30-11-00		197	Nov 30/79	30-11-12		402	Feb 28/77
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30-11-00		A101	May 30/79	30-11-14		403	Aug 30/76
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30-11-00		A104	Nov 30/79	30-11-15		403	May 30/76
30-11-00		A105	Nov 30/79	30-11-16		401	Mar 31/00
30-11-00		A106	Nov 30/79	30-11-16		402	Mar 31/00
30-11-00		A107	Feb 29/80	30-11-16		403	Aug 30/75
30-11-00		401	May 30/76	30-11-16		404	Aug 30/75
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30-11-00		503	Nov 30/80	30-11-16		509	May 30/79
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30-11-00		508	Mar 30/01				
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30-11-00		510	May 30/79	30-12-00		2	Aug 30/75

PRINTED IN ENGLAND

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
30-12-00		3	Nov 30/77	30-31-00		15	Jun 30/75
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30-12-00		7	Nov 30/77	30-31-00		104	Aug 30/78
30-12-00		601	Feb 29/76	30-31-00		105	Aug 30/78
30-12-00		602	Feb 29/76	30-31-00		106	Aug 30/78
30-12-00		801	Mar 31/00	30-31-00		107	Aug 30/78
30-12-00		802	Mar 31/00	30-31-00		108	Nov 30/76
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30-12-00		806	Mar 31/00	30-31-00		112	Aug 30/78
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				30-31-00		119	Nov 30/76
30-21-00		1	Feb 29/76	30-31-00		120	Nov 30/76
30-21-00		2	May 30/81	30-31-00		121	Nov 30/76
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30-21-00		803	May 30/77	30-31-00		132	Nov 30/79
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30-31-00		14	Feb 28/77	30-41-00		5	Feb 28/77

PRINTED IN ENGLAND

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30-41-00		107	May 30/83	30-41-00		402	Aug 30/77
30-41-00		108	May 30/83	30-41-00		403	Aug 30/77
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30-41-00		127	Aug 30/78	30-41-00		519	May 30/78
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30-41-00		132	Feb 29/80	30-41-00		524	May 30/78
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30-41-00		134	Feb 28/77	30-41-00		526	May 30/78
30-41-00		135	Feb 28/77	30-41-00		527	May 30/78
30-41-00		136	Feb 28/77	30-41-00		528	Feb 28/77

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
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30-41-00		801	May 30/83	30-42-00		110	Mar 31/99
30-41-00		802	May 30/83	30-42-00		111	Mar 31/99
30-41-00		803	May 30/83	30-42-00		112	Mar 31/99
30-41-00		804	May 30/83	30-42-00		401	Mar 31/99
30-41-00		805	May 30/83	30-42-00		402	Mar 31/99
30-41-00		806	May 30/83	30-42-00		403	Mar 31/99
30-41-00		807	May 30/83	30-42-00		404	Mar 31/99
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30-41-00		814	May 30/83	30-42-00		503	Mar 31/99
30-41-11		401	Aug 30/76	30-42-00		504	Mar 31/99
30-41-11		402	Aug 30/76	30-42-00		505	Mar 31/99
30-41-11		403	Aug 30/76	30-42-00		506	Mar 31/99
30-41-12		401	Nov 30/77	30-42-00		507	Mar 31/99
30-41-12		402	Nov 30/77	30-42-00		508	Mar 31/99
30-41-12		403	Nov 30/77	30-42-00		601	Mar 31/99
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30-41-12		505	Aug 30/76	30-42-11		405	Mar 31/99
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30-42-00		4	Mar 31/99	30-42-12		404	Feb 28/79
30-42-00		5	Mar 31/99	30-42-12		405	Feb 28/79
30-42-00		6	Mar 31/99	30-42-13		301	Nov 30/80
30-42-00		7	Mar 31/99	30-42-13		302	Feb 28/81
30-42-00		8	Mar 31/99	30-42-13		303	Sep 30/88
30-42-00		9	Mar 31/99	30-42-13		401	Mar 31/99
30-42-00		10	Mar 31/99	30-42-13		402	Mar 31/99
30-42-00		11	Mar 31/99	30-42-13		403	May 30/78
30-42-00		12	Mar 31/99	30-42-13		404	May 30/81
30-42-00		101	Mar 31/99	30-42-13		405	May 30/81
30-42-00		102	Mar 31/99	30-42-14		401	Mar 31/99

PRINTED IN ENGLAND

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
30-42-14		402	Mar 31/99	30-71-00		107	Aug 30/78
30-42-14		403	Mar 31/99	30-71-00		108	May 30/76
30-42-14		404	Mar 31/99	30-71-00		109	May 30/76
30-42-14		405	Mar 31/99	30-71-00		110	May 30/76
30-42-14		406	Mar 31/99	30-71-00		111	May 30/76
30-42-14		407	Mar 31/99	30-71-00		112	Feb 29/80
30-42-14		408	Mar 31/99	30-71-00		113	May 30/76
30-42-14		409	Mar 31/99	30-71-00		114	May 30/76
30-42-14		410	Mar 31/99	30-71-00		115	May 30/76
30-42-14		411	Mar 31/99	30-71-00		116	Feb 29/80
30-42-14		501	Mar 31/99	30-71-00		117	Aug 30/80
30-42-14		502	Mar 31/99	30-71-00		118	Nov 30/79
30-42-14		503	Mar 31/99	30-71-00		501	Aug 30/76
30-42-14		504	Mar 31/99	30-71-00		502	Aug 30/76
30-42-22		401	Aug 30/80	30-71-00		503	Feb 28/77
30-42-22		402	Aug 30/80	30-71-00		504	Feb 28/77
30-42-22		403	Aug 30/80	30-71-00		505	Feb 28/77
30-42-23		401	Aug 30/80				
30-42-23		402	Aug 30/80	30-72-00		1	Mar 31/00
30-42-23		403	Aug 30/80	30-72-00		2	Mar 31/00
30-42-24		401	Aug 30/80	30-72-00		3	Aug 30/80
30-42-24		402	Aug 30/80	30-72-00		4	Aug 30/80
30-42-24		403	Aug 30/80	30-72-00		5	Aug 30/80
30-42-25		401	Aug 30/80	30-72-00		6	Aug 30/80
30-42-25		402	Aug 30/80	30-72-00		101	Feb 29/80
30-42-25		403	Aug 30/80	30-72-00		102	Feb 29/80
30-42-25		404	Aug 30/80	30-72-00		103	Nov 30/79
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30-42-26		404	Aug 30/80	30-72-00		108	Aug 30/78
30-42-26		405	Aug 30/80	30-72-00		109	Aug 30/78
30-42-26		406	Aug 30/80	30-72-00		110	Aug 30/78
30-42-26		407	Aug 30/80	30-72-00		111	May 30/78
				30-72-00		112	Nov 30/79
30-71-00		1	Jun 30/75	30-72-00		113	Nov 30/79
30-71-00		2	Jun 30/75	30-72-00		501	Nov 30/76
30-71-00		3	Jun 30/75	30-72-00		502	Nov 30/76
30-71-00		4	Jun 30/75	30-72-00		503	Nov 30/76
30-71-00		5	Jun 30/75	30-72-00		504	Nov 30/76
30-71-00		6	Aug 30/75	30-72-00		601	Mar 29/96
30-71-00		7	Aug 30/75	30-72-00		602	Mar 29/96
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30-71-00		102	May 30/76	30-72-00		604	Mar 29/96
30-71-00		103	May 30/76	30-72-00		605	Mar 29/96
30-71-00		104	May 30/76	30-72-11		401	Nov 30/76
30-71-00		105	May 30/76	30-72-11		402	Nov 30/76
30-71-00		106	Aug 30/76	30-72-11		403	Nov 30/76

CH/SE/SU	C	PAGE	DATE
30-72-11		404	Nov 30/76
30-72-11		501	Feb 28/77
30-72-11		502	Feb 28/77
30-72-11		503	Feb 28/77
30-72-11		504	Feb 28/77
30-73-00		1	May 30/79
30-73-00		2	May 30/79
30-73-00		101	Jun 30/75
30-73-00		102	May 30/79
30-73-00		103	May 30/79
30-73-00		104	May 30/79
30-73-00		105	Aug 30/80
30-73-00		106	Nov 30/79
30-73-00		501	Aug 30/80
30-73-00		502	Nov 30/79
30-73-00		503	Nov 30/79
30-73-21		401	Aug 30/80
30-73-21		402	Nov 30/79
30-73-21		501	May 30/79
30-73-21		502	May 30/79
30-73-21		503	May 30/79
30-81-00		1	Mar 31/00
30-81-00		2	Mar 31/00
30-81-00		3	Mar 31/00
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30-81-00		507	Mar 31/00
30-81-00		508	Mar 31/00
30-81-00		509	Mar 31/00
30-81-00		510	Mar 31/00
30-81-11		401	Aug 30/77
30-81-11		402	Feb 28/81
30-81-12		401	May 30/79
30-81-12		402	May 30/79
30-81-12		403	May 30/79
30-81-12		404	May 30/79
30-81-12		601	Sep 30/87
30-81-12		602	Sep 30/87

SERVICE BULLETIN LIST

In the following service bulletin list, SB indicates an aircraft manufacturers bulletin, AEB indicates an airline engineering bulletin and OL indicates an engine manufacturers bulletin (complete identification OL.593-XX-XXX).

	SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
R	SB 30-001		Feb 28/79	Embodied Ice and rain protection -Windscreen wipers -To modify the system.
	SB 30-001	01		Embodied Ice and rain protection -Windscreen wipers -To modify the system.
	SB 30-001	02		Embodied Ice and rain protection -Windscreen wipers to modify the system
	SB 30-002			Not applicable
	SB 30-002	01		Not applicable
	SB 30-002	02		Embodied Ice and Rain Protection. Cyclic Timer - To add additional test points
	SB 30-003			Embodied Ice and rain protection -Air intake leading edge -Replacement of centre and sidewall de-icing heaters.
	SB 30-003	01		Embodied Ice and rain protection -Air intake leading edge -Replacement of centre and sidewall de-icing heaters.
	SB 30-003	02		Applicable Ice and Rain Protection. Air Intake Leading Edge - Replacement of Centre and Sidewall De-icing
R	SB 30-004			Embodied Ice and rain protection -To introduce a Windshield washer system
	SB 30-005			Embodied Ice and rain protection -Rain dispersal system-Deletion of partial functional check for windshield wipers and introduction of new maintenance requirements
	SB 30-005	01		Embodied Ice and rain protection -Rain dispersal system=Deletion of partial functional check for windshield wipers and introduction of new maintenance requirements

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
SB 30-006			Not applicable
SB 30-007			No effect Ice and Rain Protection - Increase the length of ice detector hoses
SB 30-007	01		No effect Ice and Rain Protection - Increase the length of ice detector hoses
SB 30-009			No effect Ice and Rain Protection. Rain Dispersal System. To increase the bend radii of the windshield wiper flexible drive
SB 30-010			No effect Ice and Rain Protection - Air intakes - Modification to rear ramp leading edge de-icing assembly to prevent damage to electrical cables
SB 30-011			Not applicable
SB 30-012			No effect Ice & Rain Protection. Detection - To introduce a modified ice detector head (SMITHS INDUSTRIES SB 30-3)
SB 30-012	01		No effect Ice & Rain Protection. Detection - To introduce a modified ice detector head (SMITHS INDUSTRIES SB 30-3)
SB 30-013		Nov 30/80	Embodied Ice & Rain Protection. Rain Dispersal System - To delete the windshield wiper parked position
SB 30-013	01		Applicable Ice & Rain Protection. Rain Dispersal System - To delete the windshield wiper parked position
SB 30-013	02		Applicable Ice & Rain Protection. Rain Dispersal System - To delete the windshield wiper parked position
SB 30-013	03		Embodied Ice & Rain Protection. Rain Dispersal System - To delete the windshield wiper parked position
SB 30-014			Not applicable

SERVICE BULLETIN LIST

	SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
	SB 30-015			Applicable Ice and Rain Protection. Windshield Wiper Head - To introduce a positive locking in a gear assembly.
	SB 30-015	01		No effect Ice and Rain Protection. Windshield Wiper Head - To introduce a positive locking in a gear assembly.
	SB 30-016			No effect Windows and Windshields. Rain repellent - To introduce a replacement solenoid valve.
	SB 30-016	01		No effect Windows and Windshields. Rain repellent - To introduce a replacement solenoid valve.
R	SB 30-017			Applicable. Ice and Rain Protection. Visor - To provide an acceptable reduction in the level of temperature sensing.
R	SB 30-017	01		No effect Ice and Rain Protection. Visor - To provide an acceptable reduction in the level of temperature sensing.
R	SB 30-018			No effect Ice and Rain Protection. Air Intake De-icing Power Switching Units - Inspection of electrical connectors.
R	SB 30-019			No effect Ice and Rain Protection. Toilet Drains Anti-Icing - Install alternative toilet drain pipe thermostat and mounting.
R	SB 30-020			Embodied Ice and Rain Protection. Deletion of the rain repellent system.
R	SB 30-020	01	Mar 31/99	Embodied Ice and Rain Protection. Deletion of the rain repellent system.

SB/AEB NO	REV	INC. IN REVISION	DESCRIPTION
SB 30A008			Embodied Ice and Rain Protection. Water System Anti-icing - Inspection of heating tapes in nose landing gear bay and in rear hydraulics bay.
SB 30A008	01		Embodied Ice and Rain Protection. Water System Anti-icing - Inspection of heating tapes in nose landing gear bay and in rear hydraulics bay.
SB 54-036			Applicable Nacelles/Pylons. Auxiliary Structure Engine Air Intakes - To improve engine performance by introduction of redesigned air intake bottom lips and rear ramp leading edges.
SB 54-036	01	Nov 30/79	Embodied Nacelles/Pylons. Auxiliary Structure Engine Air Intakes - To improve engine performance by introduction of redesigned air intake bottom lips and rear ramp leading edges.

CHAPTER 30

ICE AND RAIN PROTECTION

TABLE OF CONTENTS

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GENERAL - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)

NOTE: The hot air de-icing of the engine inlet guide vanes and nose bullet is dealt with in Chapter 75.

A. Wing and Intake De-icing

The wing leading edges from the wing root to aft of the engine intakes, and the leading edges in and around the intakes, are provided with electric heating elements, to protect the engines from the ingestion of large particles of ice shed during flight. The heating elements control the shedding so that ice accretions are broken up into particles of a size acceptable to the engines.

Most of the elements in the intake and a certain number on the wing are activated by cyclically controlled power supplies. The remainder of the elements are activated by continuous power supplies.

B. Probe, Vent and Sensor Heating

All the air data probes and sensors, and a number of the static vents exposed to the airflow, are provided with electric heating elements to prevent inaccuracies caused by ice accretion.

R B WARNING: WHEN SWITCHED ON PROBES & SENSORS GET HOT.

R B Before maintenance work is carried out in the vicinity
R B of probes, vents and vanes, check the relevant heating
R B supply is 'OFF', and a "DO NOT OPERATE" sign is placed
R B on the heater control switch.

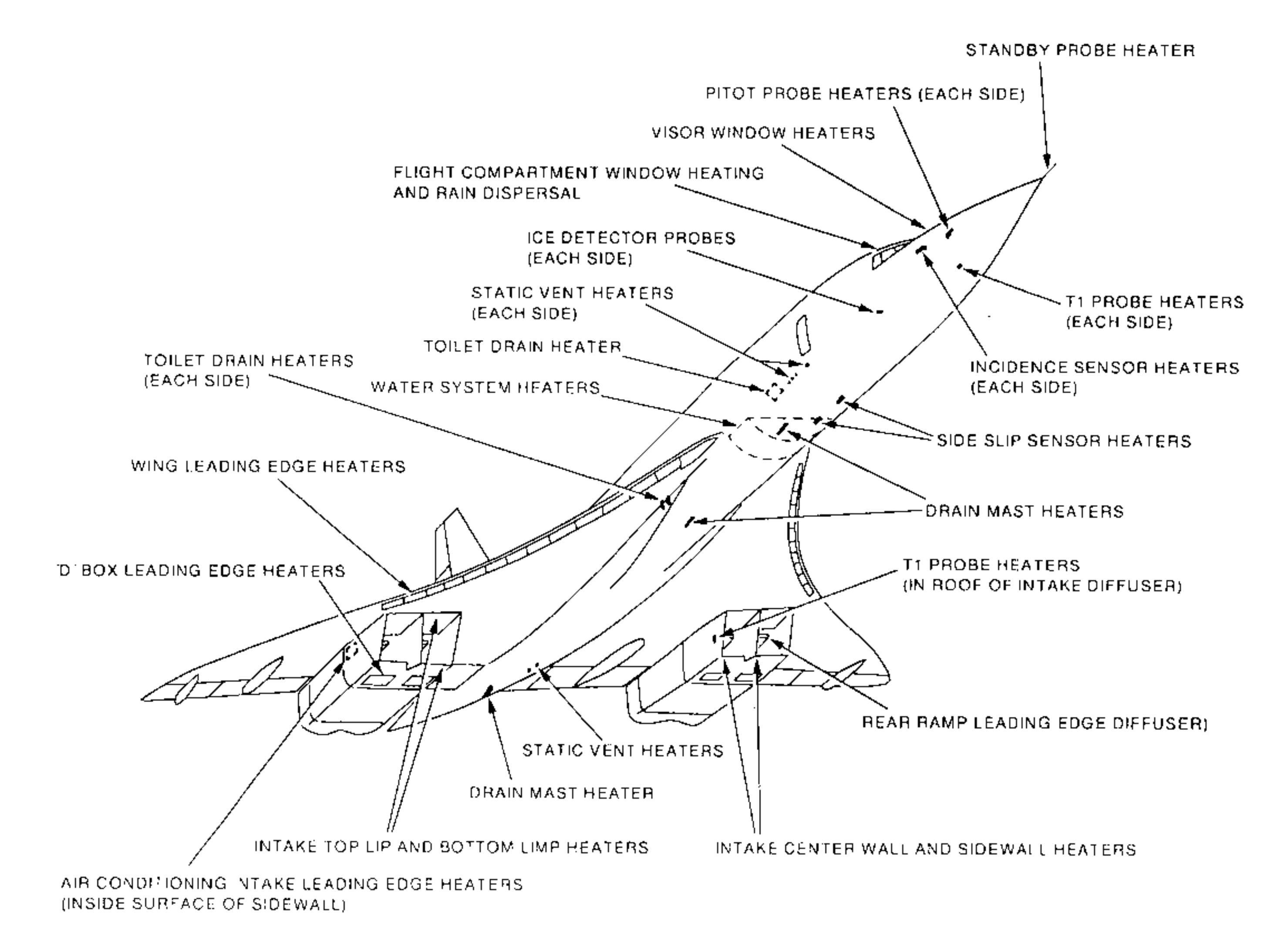
R B Ground operation of probe, vent, vane heaters must be
R B kept to a minimum. Heaters may only be operated on
R B the ground, during Maintenance.

R B CAUTION: PROBE, VENT, AND VANE HEATER MUST NOT BE
R B SWITCHED 'ON' WHEN LEAK TESTING ADAPTORS,
R B PROTECTIVE COVERS OR BLANKS ARE FITTED.

C. Flight Compartment and Visor Window Heating

All the flight compartment and visor windows are provided with electric heating elements to protect against obscuration by ice and/or mist.

Protection against ice and mist is provided for the windshields and visor windows, and mist only for the D.V. (direct vision) and side windows.



Ice and Rain Protection
Figure 001

D. Rain Dispersal

Each windshield is provided with a wiper for dispersing
R light or heavy rain when the visor is down.

R
R The rain repellent fluid system has been rendered
R inoperative. To restore and enhance the rain repellent
R capability, Surfex 100 rain repellent coating has been
R applied to the flight deck windshields. (Ref. 12-30-30).
R

E. Drain Mast Heating

The outlet pipe of each water system drain mast is provided with electric heating elements, to protect against blockages from frozen water waste.

F. Water System Anti-icing

Certain pipes and components in the potable and waste water systems are provided with electrical heating elements, to protect against freezing of the water.

G. Toilet Drain Anti-icing

The lower section of each toilet (closet) drain is provided with electrical heating elements, to protect against the freezing of the waste that may accumulate in the drain.

H. Ice Detection

Two ice detection systems are provided, to give warning when icing conditions prevail. Sensing is effected by probes projecting into the airflow.

GENERAL - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

A. Introduction

This topic contains general instructions for the removal and installation of typical minor electrical components, e.g., switches, caption light modules and relays, fitted to panels and in relay boxes that are common to sub-systems within Chapter 30. These panels/relay boxes are as follows:-

Flight compartment roof panel (4-211)

LH ice relay box (13-123)

RH ice relay box (16-123)

LH air and ice contactor box (21-123)

RH air and ice contactor box (23-123)

De-icing panel LH (1-131)

De-icing panel RH (1-132)

It should be noted that although under each major heading there are separate Removal & Installation procedures for the various types of component, the 'Equipment & Materials', 'Prepare' & 'Conclusion' paragraphs are applicable to all components.

Instructions for the removal and installation of minor electrical components mounted on the LH and RH de-icing contactor panels (2-131, 3-131, 2-132 and 3-132) are contained in 30-11-00.

B. Flight Compartment Roof Panel

The flight compartment roof panel is centrally mounted between the two pilots' stations and contains switches, magnetic indicators and caption light modules used in the ice and rain protection systems.

Access to components mounted on sub-panel 3 of the roof panel (rear switch panel), is gained by lowering the sub-panel on its hinges. Access to components on

sub-panel 1 of the roof panel (forward switch panel), is gained by releasing the quick-release fasteners and withdrawing the sub-panel from the main panel structure.

Switches and magnetic indicators are mounted from the rear of the appropriate sub-panel. Caption light modules are mounted from the front of the panel and clamped to the panel at the rear by a mounting sleeve.

Cable formers, which act as panel strengthening supports on the rear of each sub-panel, support cable looms and terminal blocks which may restrict access to components, terminals or connectors. These cable looms and terminal blocks may be temporarily moved to facilitate access to electrical components. To remove and install a magnetic indicator, it is necessary to withdraw the associated electroluminescent panel (Ref. 33-16-00) sufficiently to gain access to the magnetic indicator securing screws.

Electrical connections to toggle switches, push-switches, caption light modules and magnetic indicators are made to screw-type or socket-type terminals, and to rotary switches by flying leads.

C. Relay and Contactor Boxes

The ice relay boxes (13-123 and 16-123) and the air/ice contactor boxes (21-123 and 23-123) are housed in the forward underfloor equipment racking, and contain relays, contactors, diodes and capacitors used in the ice and rain protection systems. In addition, each relay and contactor box accommodates current sensors associated with the anti-icing of the pitot and static system (Ref. 30-31-00) and the drain mast system (Ref. 30-71-00). Sufficient cable is provided to allow each box to be withdrawn from the rack for individual component renewal and/or minor repair/modification without the necessity for electrically disconnecting the box from the aircraft wiring; thus the subsequent test requires a test of only the associated circuit/component.

Components within the boxes are mounted on one side of a vertical chassis with the associated wiring assembled on the reverse side. Access to components in the contactor boxes is gained by removing the associated side cover from the box. The relay boxes are not fitted with side covers, therefore direct access to the relays is possible. The diodes in each relay box are mounted on an insulating board, fitted to the chassis by distance pillars, and protected by a diode cover.

Relays are plug-in type, each being secured to its base by nuts and washers, or by a spring clamp. Diodes have terminal tags crimped to wire ends which are connected to mounted studs with securing nuts and washers.

D. De-icing Panels

The LH and RH de-icing panels (1-131 and 1-132) are mounted between vertical floor struts, behind the sidewall panels ~~of the lower baggage compartment. The panels accommodate~~ relays, current sensors and diodes. The diodes are mounted on a diode board assembly enclosed with a cover. Cables from three electrical connectors at the top of each panel are routed down the rear face of the panel and brought out to the relays, current sensors and diodes on the front face through adjacent grommets.

2. Components on Flight Compartment Roof Panel (Ref. Fig. 401, 402 and 403)

CAUTION: ELECTROLUMINESCENT (EL) PANELS ARE VULNERABLE TO SCRATCHING AND CRACKING. ENSURE THAT TOOLS USED IN THE FOLLOWING OPERATIONS DO NOT DAMAGE THE POLISHED WALLS OF THE PANELS.

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

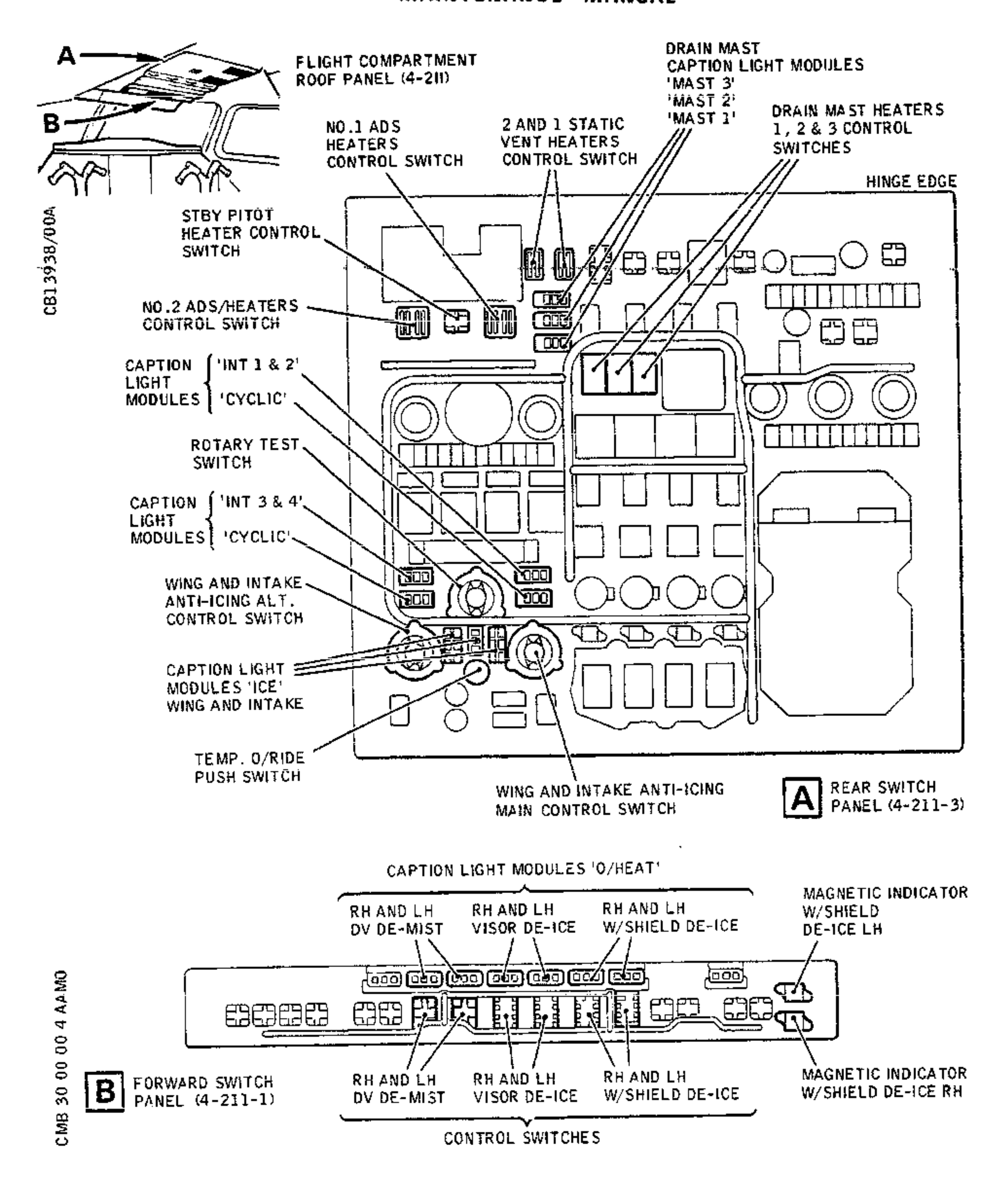
B. Prepare

NOTE: On electrical components with socket-type terminals the pin inserts must be disconnected and connected in accordance with the Wiring Diagram Manual, 20-42-18.

(1) For components on the rear switch panel (4-211-3), isolate the electrical generation and external power supplies as detailed in 24-00-00, Servicing.

(2) Support the rear switch panel, release the quick-release fasteners and lower the switch panel on its hinges.

(3) For components on the forward switch panel (4-211-1), trip all the circuit breakers listed below and fit



\- Flight Compartment Roof Panel (4-211)
Diagrammatic Rear View
Figure 401

safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
RH LDG LT CONT	13-215	L21	B11
RH LDG LT SUP	13-215	L24	C12
ROOF PNL INST LTS SUP	13-215	L379	F11
LH LDG/TAXI LT CONT	14-215	L41	E11
LH LDG/TAXI LT SUP	14-215	L45	E10
LDG/TAXI LTS POSN IND	15-215	L43	A13
LH TAXI/TURN OFF LT SUP	15-215	L47	A14
LH FLAT VISOR HTR CONT	15-215	1H222	C11
LH BOTTOM AND CURVED VISOR HTR CONT	15-215	1H224	C12
LH DV WINDOW HTR CONT	15-215	1H182	C10
RH LDG/TAXI LT CONT	13-216	L42	B9
RH LDG/TAXI LT SUP	13-216	L46	B8
ROOF & CB PNL 13-213 LTS SUP	13-216	L81	A8
LH LDG LT CONT	14-216	L22	D8
LH LDG LT SUP	14-216	L25	C8
LDG LTS POSN IND	15-216	L23	A12
TAXI/TURN OFF LTS CONT	15-216	L44	B13
RH TAXI/TURN OFF LT SUP	15-216	L48	B12
RH W/SCREEN HTR CONT	15-216	2H142	B17

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
RH FLAT VISOR CONT	15-216	2H222	C15
RH BOTTOM AND CURVED VISOR HTR CONT	15-216	2H224	C16
RH DV WINDOW HTR CONT	15-216	2H182	C14
LH W/SCREEN HTR CONT	1-213	1H142	J9

(4) Release the quick-release fasteners and withdraw the forward switch panel from the mounting structure.

C. Remove Toggle Switch or Push-switch

(1) On a switch with screw-type terminals, roll back the rubber terminal cover and disconnect the electrical cables from the switch. On a switch with socket-type terminals, using a suitable tool, withdraw the pin inserts.

(2) Where necessary unscrew the push-switch knob. Using a tubular spanner, remove the nut and washer from the front of the panel and withdraw the switch and tabwasher from the rear.

D. Install Toggle Switch or Push-switch

(1) Comply with the electrical safety precautions.

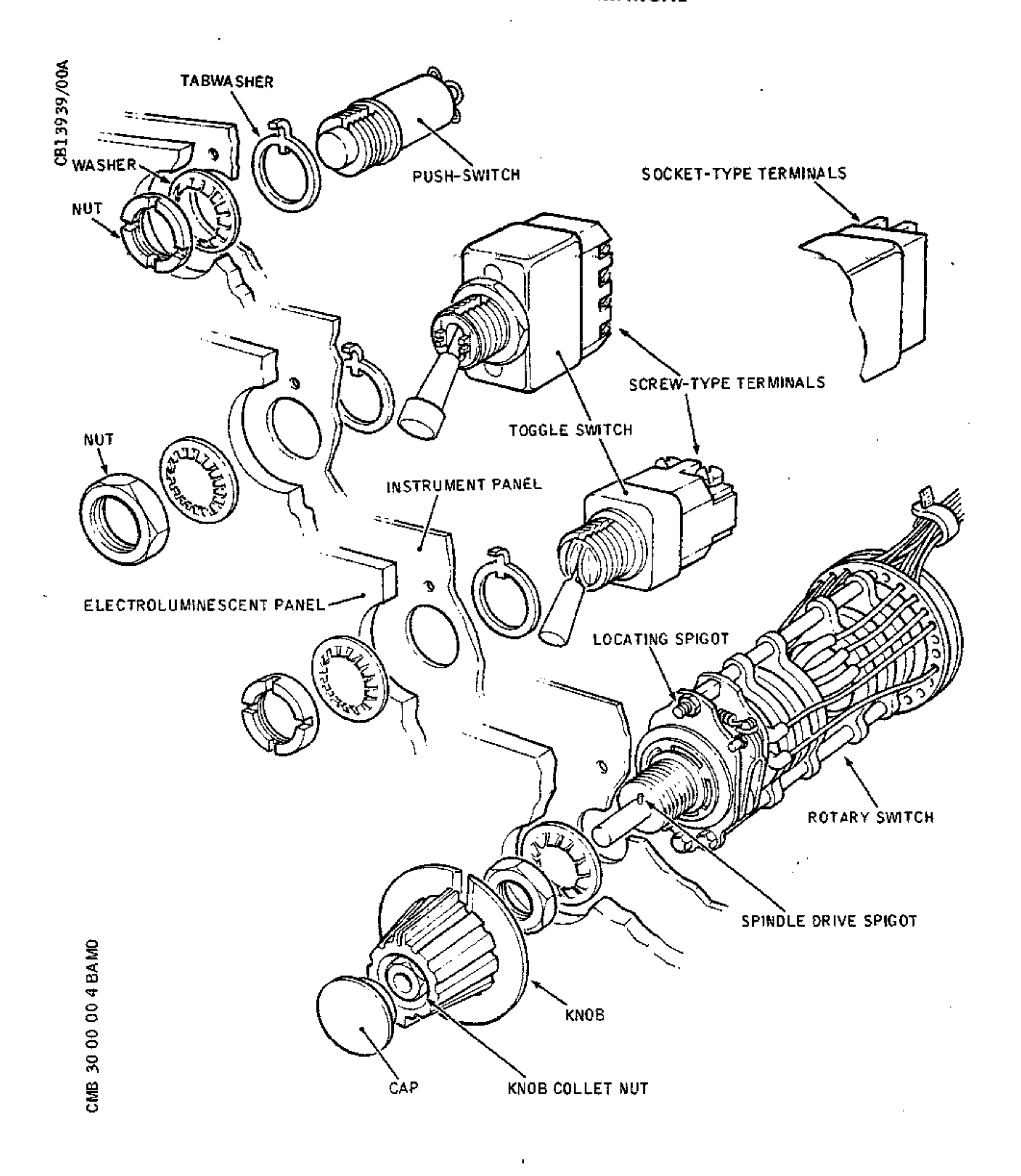
(2) Position the tabwasher on the switch and insert the switch through the aperture from the rear of the panel, ensuring that the tab on the washer engages the locating hole in the panel.

NOTE: Dowty-type toggle switches are suplied with two fixing nuts, one of which is discarded before installation.

(3) Secure the switch with the nut and washer. Where necessary, refit the push-switch knob.

(4) Connect the electrical cables to the switch, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring

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Switches - Installation
Figure 402

diagram. Position the rubber terminal cover over the screw-type terminals.

E. Remove Rotary Switch

R NOTE: To reduce removal time of the switch it is permitted to fit in-line splices to the associated wiring.

R (1) ~~Release the flying leads from the loom ties.~~

R (2) Using a suitable tool, withdraw the pin inserts from module block or, where necessary, cut the wires at suitable positions to enable splices to be staggered along the loom run. Care should be taken to ensure that this operation is contained within an area of 2.4 in (61 mm) from the edge of the panel, to ensure that panel closing is satisfactory.

R (3) Remove the cap from the end of the switch knob, loosen the collet nut and withdraw the knob from the switch spindle.

R (4) Using a tubular spanner, remove the nut and washer from the front of the panel and withdraw the switch from the rear.

F. Install Rotary Switch

R NOTE: To reduce installation time of the switch it is permitted to fit in-line splices to the associated wiring.

(1) Comply with the electrical safety precautions.

(2) Insert the switch through the aperture from the rear of the panel, ensuring that the locating spigot engages the locating hole in the panel.

(3) Secure the switch with the nut and washer.

(4) Fit the knob on the switch spindle, ensuring that the spindle spigot is engaged with the slot in the knob. Tighten the collet nut and fit the end cap.

R (5) Using a suitable tool, connect the flying leads to the module block, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram. Alternatively, if in-line splines are to be used, fit them in accordance with Wiring Diagram Manual 20-42-12,

R ensuring that the connections are made in accordance
R with the wire identifications and the applicable wir-
R ing diagram. The splices should be staggered along
R the loom run and care should be taken to ensure that
R this operation is contained within an area of 2.4 in
R (61 mm) from the edge of the panel, to ensure that
R panel closing is satisfactory.

(6) Secure the flying leads to the cable loom with suitable ties in accordance with 20-27-15.

G. Remove Caption Light Module

(1) If necessary, release the cable loom ties to gain access to the pin inserts at the rear of the caption light module.

(2) Disconnect the electrical cables from the terminals. On modules with socket-type terminals, using a suitable tool, withdraw the pin inserts from the module.

(3) Disengage the mounting sleeve clamp retaining springs at the rear of the module, and withdraw the module from the front of the panel and the mounting sleeve from the rear.

H. Install Caption Light Module

(1) Comply with the electrical safety precautions.

(2) Position the mounting sleeve on the rear of the panel and insert the caption light module through the aperture from the front, ensuring that the hinged edge of the module is in alignment with the white-painted line on the back of the panel, and that the mounted sleeve is aligned symmetrically with the module.

(3) Hold the module firmly against the front of the panel and press the mounting sleeve into position from the rear until the sleeve retaining springs engage the recesses in the module body.

(4) Connect the electrical cables to the module terminal screws, or, using a suitable tool, connect the pin inserts to the module, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(5) Refit the cable loom ties, as necessary, in

accordance with 20-27-15.

I. Remove Magnetic Indicator

(1) If necessary, release the cable loom ties to gain access to the terminals at the rear of the magnetic indicator.

(2) Withdraw the pin inserts from the rear of the indicator.

(3) Remove the associated electroluminescent (EL) panel (Ref. 33-16-00) sufficiently to gain access to the magnetic indicator securing screws.

(4) Remove the securing screws from the front of the panel and withdraw the magnetic indicator from the rear.

J. Install Magnetic Indicator

(1) Comply with the electrical safety precautions.

(2) Assemble the magnetic indicator to the panel from the rear, ensuring that the word TOP on the body of the indicator is in alignment with the white-painted line at the back of the panel.

(3) Secure the indicator to the panel with the securing screws, from the front.

(4) Refit the EL panel to its mounting (Ref. 33-16-00).

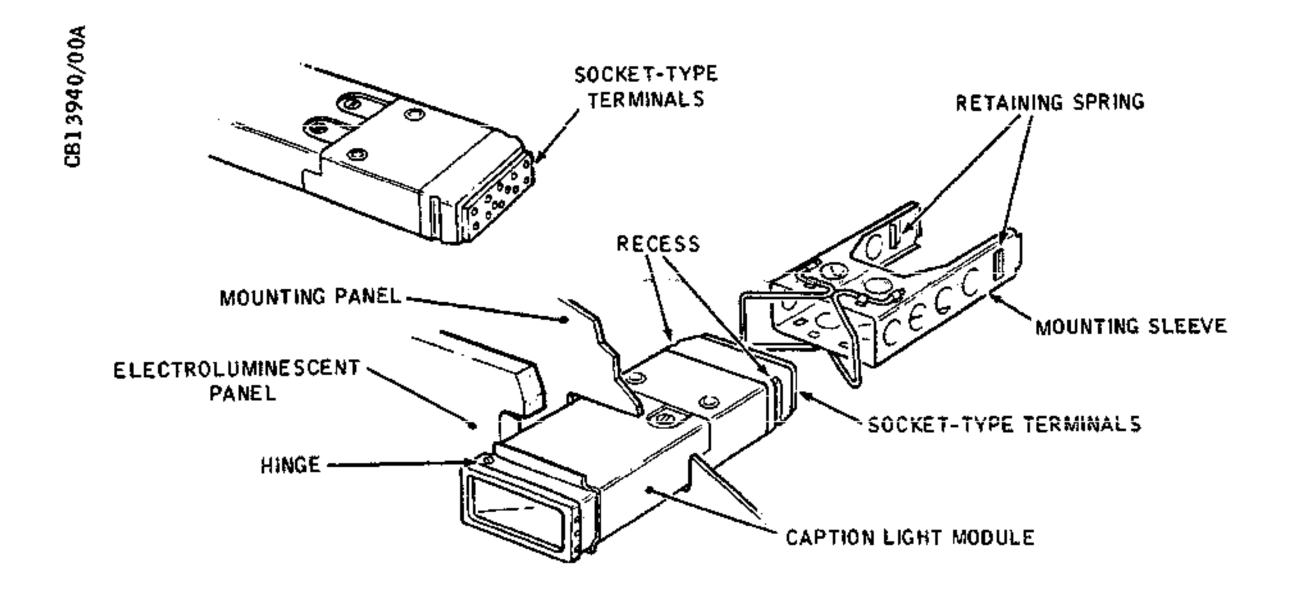
(5) Connect the electrical cables to the indicator terminals, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

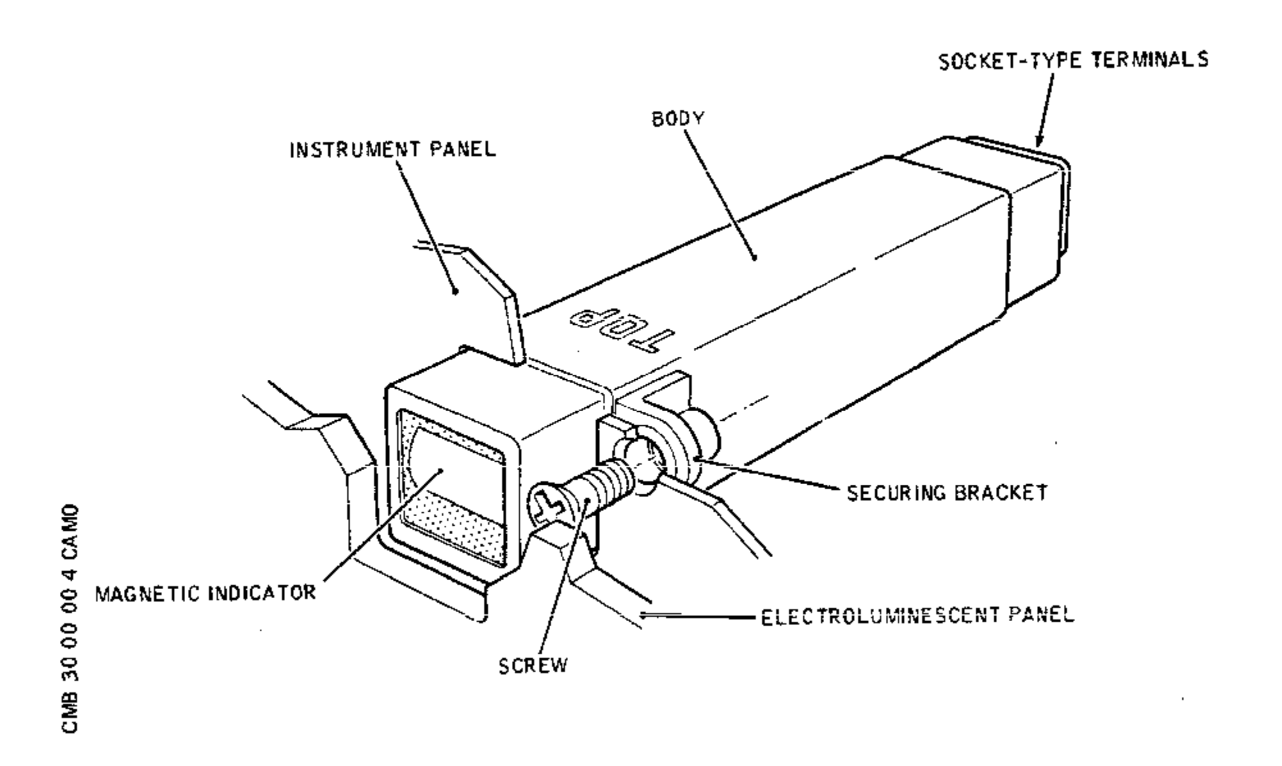
(6) Secure the cable loom ties, as necessary, in accordance with 20-27-15.

K. Conclusion

(1) Close and secure the panel or refit the panel to its mounting and secure it with the quick-release fasteners, as applicable.

(2) Cancel the electrical safety precautions taken before removal, or make available electrical ground power as detailed in 24-41-00, as applicable, and check the operation of the component by carrying





- Caption Light Modules and Magnetic Indicators -
Installation
Figure 403

out the appropriate test procedure.

3. Components in Ice Relay Boxes (13-123 and 16-123) (Ref. Fig. 404)

CAUTION: CERTAIN RELAYS WITHIN THE BOXES ARE PHYSICALLY INTERCHANGEABLE BUT ARE NOT ELECTRICALLY INTERCHANGEABLE. DURING RELAY REPLACEMENT ENSURE THAT THE CORRECT RELAY IS FITTED TO THE APPROPRIATE SOCKET.

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Torque spanner, 8.5 to 9.5 lbf in (0.096 to 0.107 mdaN), for current sensor	- -
Torque spanner, 6 to 7 lbf in (0.068 to 0.079 mdaN), for diode	-
Torque spanner, 3 to 3.5 lbf in (0.034 to 0.040 mdaN), for diode	-

B. Prepare

(1) Trip the associated circuit breakers listed below and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH ice relay box (13-123)			
ADS 1 PROBE HTRS CONT	1-213	1H1	K8
ADS 1 PROBE HTRS IND	1-213	1H2	K9
ADS 1 PITOT PROBE HTR SUP	2-213	1H3	F22
ADS 1 S/SLIP PROBE HTS SUP	2-213	1H4	F23
ADS 1 A/ATTACK PROBE HTR SUP	2-213	1H5	F24

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ADS 1 TOTAL TEMP HTR SUP	2-213	1H21	G24
LH CYCLIC TIMER CONT	3-213	1H1835	B11
INT 2 REAR RAMP HTR SUP	13-215	2H1415	A10
ADS 1 STATIC VENT HTR SUP	13-215	1H18	D9
DRAIN MAST HTR SUP	13-215	H1732	B10
DRAIN MASTS HTR GRD SUP	13-215	H1737	E9
INT 2 AUX DOOR D BOX HTR SUP	13-215	2H1411	A9
LH DV WINDOW HTR SUP	14-215	1H181	D9
LH FLAT VISOR HTR SUP	14-215	1H221	G5
INT 1 REAR RAMP HTR SUP	14-215	1H1415	B6
LH CURVED VISOR HTR SUP	14-215	1H223	G8
LH BOTTOM VISOR HTR SUP	14-215	1H225	E9
DRAIN MAST 2 HTR SUP	14-215	H1722	E6
INT 1 AUX DOOR D BOX HTR SUP	14-215	1H1411	B7
LH ICE DETECTOR CONT IND & SUP	15-215	1H101	A12
LH DV WINDOW HTR CONT	15-215	1H182	C10
LH FLAT VISOR HTR CONT	15-215	1H222	C11
LH BOTTOM & CURVED VISOR HTR CONT	15-215	1H224	C12
LH STATIC VENT HTR SUP	15-215	H491	G10
DRAINMAST 2 & 3 HTR CONT & 1 HTR IND	15-215	H1738	B10
WING & INT NORM CONT	15-215	1H1826	D11
LH CYCLIC NORM CONT	15-215	1H1827	F12

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
H CYCLIC ALTN CONT	15-215	1H1828	F13
LH WING NORM CONTN CONT	15-215	1H1833	F10
LH WING ALTN CONTN CONT	15-215	1H1834	F11
WING & INT NORM CONT & SUP	15-215	1H1836	D10
INT 3 AUX DOOR D BOX HTR SUP	13-216	3H1411	A10
INT 3 REAR RAMP HTR SUP	13-216	3H1415	A11
INT 4 AUX DOOR D BOX HTR SUP	14-216	4H1411	A15
INT 4 REAR RAMP HTR SUP	14-216	4H1415	A14
LH WING CONTN IND	15-216	H1511	B15
LH WING & INT 1 & 2 CYCLIC IND	15-216	H1513	B14
DRAIN MAST 1 HTR CONT & 2 & 3 HTR IND	15-216	H1723	A17
WING & INT ALTN CONT	15-216	2H1826	E15
WING & INT ALTN CONT & SUP	15-216	2H1836	E14
RH ice relay box (16-123)			
ADS 2 PROBE HTRS IND	3-213	2H2	A12
ADS 2 PROBE HTRS CONT	3-213	2H1	A11
DRAIN MASTS HTR GRD SUP	13-215	H1737	E9
INT 2 AUX DOOR D BOX HTR SUP	13-215	2H1411	A9
INT 2 REAR RAMP HTR SUP	13-215	2H1415	A10
INT 1 AUX DOOR D BOX HTR SUP	14-215	1H1411	B7
INT 1 REAR RAMP HTR SUP	14-215	1H1415	B6
RH WING CONTN IND	15-215	H1512	B11

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
RH WING & INT 3 & 4 CYCLIC IND	15-215	H1514	B12
DRAIN MAST 2 & 3 HTR CONT & 1 HTR IND	15-215	H1738	B10
WING & INT NORM CONT	15-215	1H1826	D11
WING & INT NORM CONT & SUP	15-215	1H1836	D10
ADS 2 PITOT PROBE HTR SUP	13-216	2H3	D11
ADS 2 S/SLIP PROBE HTR SUP	13-216	2H4	D10
INT 3 REAR RAMP HTR SUP	13-216	3H1415	A11
ADS 2 A/ATTACK PROBE HTR SUP	13-216	2H5	D12
ADS 2 STATIC VENT HTR SUP	13-216	2H18	C12
ADS 2 TOTAL TEMP HTR SUP	13-216	2H21	B11
RH DV WINDOW HTR SUP	13-216	2H181	C10
RH FLAT VISOR HTR SUP	13-216	2H221	G13
RH CURVED VISOR HTR SUP	13-216	2H223	G10
RH BOTTOM VISOR HTR SUP	13-216	2H225	B10
INT 3 AUX DOOR D BOX HTR SUP	13-216	3H1411	A10
DRAIN MAST 1 HTR SUP	14-216	H1721	E14
INT 4 AUX DOOR D BOX HTR SUP	14-216	4H1411	A15
INT 4 REAR RAMP HTR SUP	14-216	4H1415	A14
RH ICE DETECTOR CONT IND & SUP	15-216	2H101	B16
RH DV WINDOW HTR CONT	15-216	2H182	C14
RH FLAT VISOR HTR CONT	15-216	2H222	C15
RH BOTTOM & CURVED VISOR HTR	15-216	2H224	C16

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
CONT			
RH STATIC VENT HTR SUP	15-216	H492	D17
DRAIN MAST 1 HTR CONT & 2 & 3 HTR IND	15-216	H1723	A17
WING & INT ALTN CONT	15-216	2H1826	E15
RH CYCLIC NORM CONT	15-216	2H1827	F18
RH CYCLIC ALTN CONT	15-216	2H1828	F19
RH WING NORMAL CONTN CONT	15-216	2H1833	F16
RH WING ALTN CONTN CONT	15-216	2H1834	F17
RH CYCLIC TIMER CONT	15-216	2H1835	D14
WING & INT ALTN CONT & SUP	15-216	2H1836	E14

(2) Open service compartment door 123 BB (Ref. 52-41-11) to gain access to the relay box mounted in the forward underfloor racking.

(3) Release the hold-down fasteners from the relay box hold-down hooks.

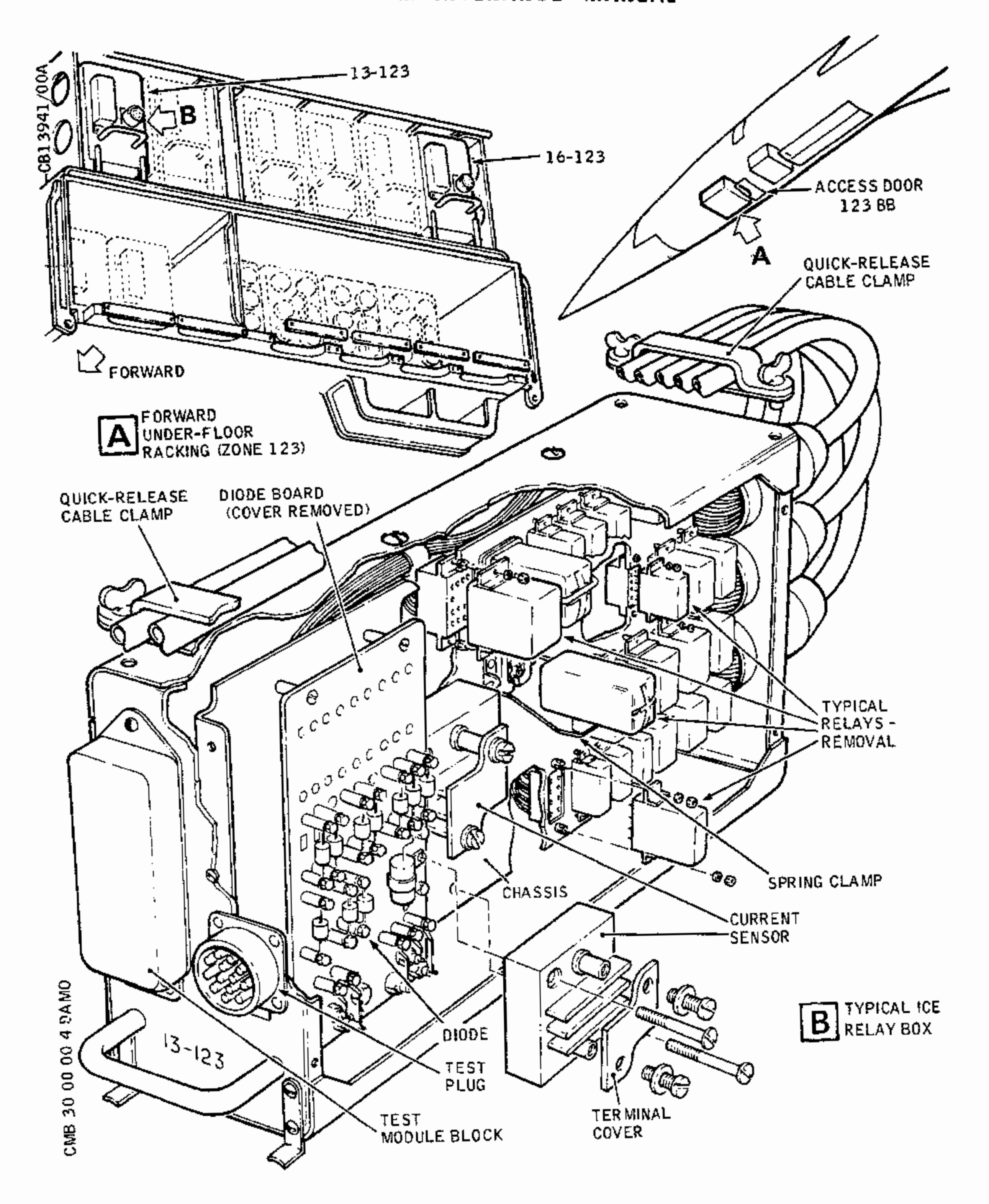
(4) Withdraw the relay box from the rack sufficiently to gain access to the quick-release cable clamps on top of the box.

(5) Release the cable clamps to detach the cables from the top of the box.

(6) Withdraw the box clear of the rack and lower it on to a suitable support.

C. Remove Relay

(1) Remove the nuts and washers or the spring clamp, as applicable, securing the relay to its mounting base, and withdraw the relay from the socket.



- Ice Relay Box Components - Installation
Figure 404

D. Install Relay

(1) Comply with the electrical safety precautions.

(2) Check that the mounting lugs of 'half cystal can size' relays are at 90 deg to the relay body. Re-align the lugs as necessary.

(3) Align the locating pin on the relay body with the locating hole in the relay mounting base, and plug the relay into the socket. For colour-coded relays, align the colour on the relay body with the identical colour on the relay base, and plug the relay into the socket.

(4) Secure the relay body to the socket with the nuts and washers, or the spring clamp, as applicable.

E. Remove Current Sensor

(1) Label the electrical cables before removal to ensure correct connection during installation.

(2) Remove the current sensor terminal cover and disconnect the electrical cables from the terminals.

(3) Remove the screws securing the current sensor to the chassis and withdraw the sensor from the relay box.

F. Install Current Sensor

(1) Comply with the electrical safety precautions.

(2) Remove the current sensor terminal cover.

(3) Position the sensor on the chassis so that terminals A and B are toward the diode board. Secure the sensor to the chassis with the screws.

(4) Connect the electrical cables to the terminals with the nuts and washers, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram. Torque-tighten the terminal nuts to between 8.5 and 9.5 lbf in (0.096 and 0.107 mdaN).

(5) Refit the terminal cover to the current sensor.

G. Remove Diode

(1) Remove the screws securing the diode board cover to the distance pillars and remove the cover from the diode board.

(2) Remove the screws and washers securing the diode board to the panel and withdraw the board sufficiently to gain access to the diode securing nuts.

(3) Disconnect the diode from the mounting studs and remove the diode from the board. Retain the diode securing nuts.

H. Install Diode

(1) Comply with the electrical safety precautions.

NOTE: If the replacement diode does not have tags fitted to wire ends, the terminal tags must be crimped to the ends in accordance with the Wiring Diagram Manual, 20-42-01. Tags for diodes are as follows:- Pin 1, Solidstrand AMP 34105; pin 2, Solidstrand 34104-T006-02.

Some replacement diodes are supplied with nuts; these nuts must be discarded and those previously employed for securing the diode to the mounting studs used instead.

(2) Position the replacement diode so that the ring on cathode end of the diode is pointing to terminal 2 on the diode board. Secure the tags to the mounting studs with the nuts and washers. On the size 4 stud, torque-tighten the terminal nut to between 3.0 and 3.5 lbf in (0.034 and 0.040 mdaN). On the size 6 stud, torque-tighten the terminal nut to between 6 and 7 lbf in (0.068 and 0.079 mdaN).

(3) Refit the diode board to the panel and secure it with the screws and washers.

(4) Refit the diode board cover to the distance pillars and secure it with the screws.

I. Conclusion

(1) Mount the relay box on the end of the rack support rails and secure the cables to the top of the panel with the quick-release cable clamps.

(2) Slide the box into the racking and secure it with

the hold-down fasteners.

(3) Check that the relay box is bonded in accordance with 20-27-11.

(4) Cancel the electrical safety precautions and check the operation of the component by carrying out the appropriate test procedure.

(5) Close and secure service compartment door 123 BB (Ref. 52-41-11).

4. Components in Air and Ice Contactor Boxes (21-123 and 23-123) (Ref. Fig. 405)

A. Equipment and Materials

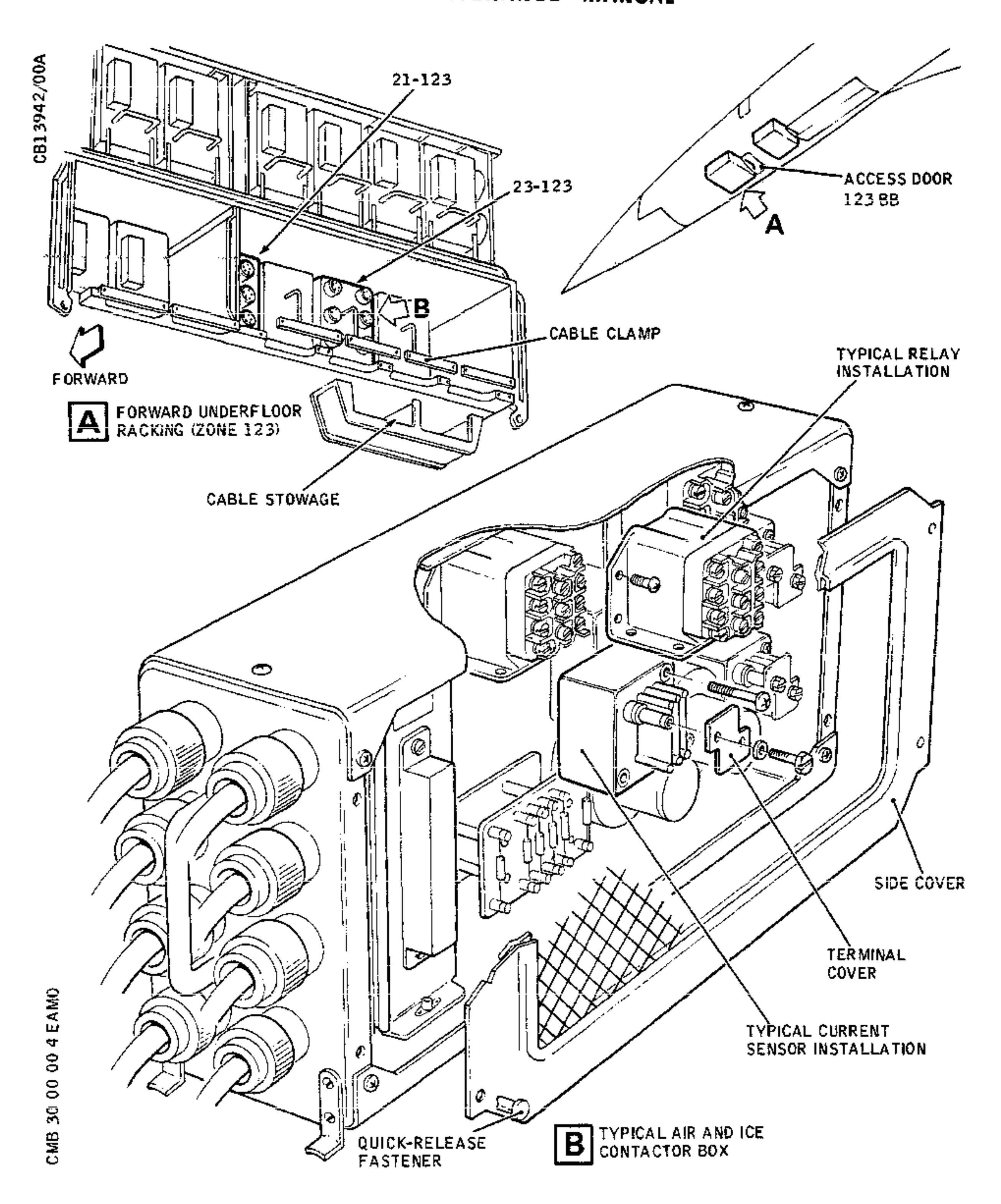
DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Torque spanner, 8.5 to 9.5 lbf in (0.096 to 0.107 mdaN), for current sensor	-

B. Prepare

(1) Trip the associated circuit breakers listed below and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH air and ice contactor box (21-123)			
ADS 1 PROBE HTRS CONT	1-213	1H1	K8
ADS 1 PROBE HTRS IND	1-213	1H2	K9
LH W/SCREEN HTR CONT	1-213	1H142	J9
ADS 1 PITOT PROBE HTR SUP	2-213	1H3	F22
ADS 1 S/SLIP PROBE HTR	2-213	1H4	F23

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
SUP			
ADS 1 A/ATTACK PROBE HTR SUP	2-213	1H5	F24
ADS 1 TOTAL TEMP HTR SUP	2-213	1H21	G24
LH W/SCREEN HTR SUP	2-213	1H141	E20
ADS 1 STATIC VENT HTR SUP	13-214	1H18	D9
RH air and ice contactor box (23-123)			
ST'BY PITOT HTR IND	1-213	H122	J10
ST'BY PITOT HTR SUP	2-213	H121	F18
ADS 2 PROBE HTR CONT	3-213	2H1	A11
ADS 2 PROBE HTRS IND	3-213	2H2	A12
ADS 2 PITOT PROBE HTR SUP	13-216	2H3	D11
ADS 2 S/SLIP PROBE HTR SUP	13-216	2H4	D10
ADS 2 A/ATTACK PROBE HTR SUP	13-216	2H5	D12
ADS 2 STATIC VENT HTR SUP	13-216	2H18	C12
ADS 2 TOTAL TEMP HTR SUP	13-216	2H21	B11
RH W/SCREEN HTR SUP	14-216	2H141	F11
RH W/SCREEN HTR CONT	15-216	2H142	B17



- Air and Ice Contactor Box Components - Installation
Figure 405

(2) Open service compartment door 123 BB (Ref. 52-41-11) to gain access to the contactor box mounted in the forward underfloor racking.

(3) For the LH contactor box (21-123), release the cable assembly by removing the appropriate cable clamp and cable clips. For the RH contactor box 23-123, remove the cable clamp and cable clips and remove the cable from its stowage under the racking.

(4) Release the hold-down fasteners from the contactor box hold-down hooks.

(5) Withdraw the box clear of the rack and lower it on to a suitable support.

(6) Release the quick-release fasteners and remove the side cover from the side of the contactor box.

C. Remove Relay

(1) Label the electrical cables to ensure correct connection during installation.

(2) Disconnect the electrical cables from the relay terminals.

(3) Support the relay and remove the screws securing the relay to the chassis. Withdraw the relay from the contactor box.

D. Install Relay

(1) Comply with the electrical safety precautions.

(2) Position the relay on the chassis so that the terminal side faces outward. Secure the relay to the chassis with the screws.

(3) Connect the electrical cables to the relay terminals, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

E. Remove Current Sensor

(1) Label the electrical cables before removal to ensure correct connection during installation.

(2) Remove the current sensor terminal cover and disconnect the electrical cables from the

terminals.

(3) Note the position of the current sensor on the chassis to ensure correct orientation of the sensor during installation.

(4) Remove the screws securing the current sensor to the chassis and withdraw the sensor from the contactor box.

F. Install Current Sensor

(1) Comply with the electrical safety precautions.

(2) Remove the current sensor terminal cover.

(3) Position the current sensor on the chassis, ensuring that it is correctly orientated, and secure it with the screws.

(4) Connect the electrical cables to the terminals, with the nuts and washers, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram. Torque-tighten the terminal nuts to between 8.5 and 9.5 lbf in (0.096 and 0.107 mdaN).

(5) Refit the terminal cover to the current sensor.

G. Conclusion

(1) Refit the cover to the side of the box and secure it with the quick-release fasteners.

(2) Mount the contactor box on the rack support rails and slide the box into its housing in the racking.

(3) Secure the box with the hold-down fasteners.

(4) Secure the cable assembly with the cable clamp and clips, or secure the cable assembly in the cable stowage under the racking, as applicable.

(5) Check that the contactor box is bonded in accordance with 20-27-11.

(6) Cancel the electrical safety precautions and check the operation of the component by carrying out the appropriate test procedure.

(7) Close and secure service compartment door 123 BB

(Ref. 52-41-11).

5. Components on De-icing Panels (1-131 and 1-132)
(Ref. Fig. 406)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Torque spanner, 8.5 to 9.5 lbf in (0.096 to 0.107 mdaN), for current sensor	-
Torque spanner, 6 to 7 lbf in (0.086 to 0.079 mdaN), for diode	-
Torque spanner, 3 to 3.5 lbf in (0.034 to 0.40 mdaN), for diode	-

B. Prepare

(1) Trip the associated circuit breakers listed below and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH de-icing panel (1-131)			
LH CYCLIC TIMER CONT	3-213	1H1835	B11
NO. 1 T1 PROBE HTR SUP	13-215	1H542	C9
INT 2 AUX DOOR D BOX HTR SUP	13-215	2H1411	A9
INT 2 REAR RAMP HTR SUP	13-215	2H1415	A10
INT 1 AUX DOOR D BOX HTR SUP	14-215	1H1411	B7

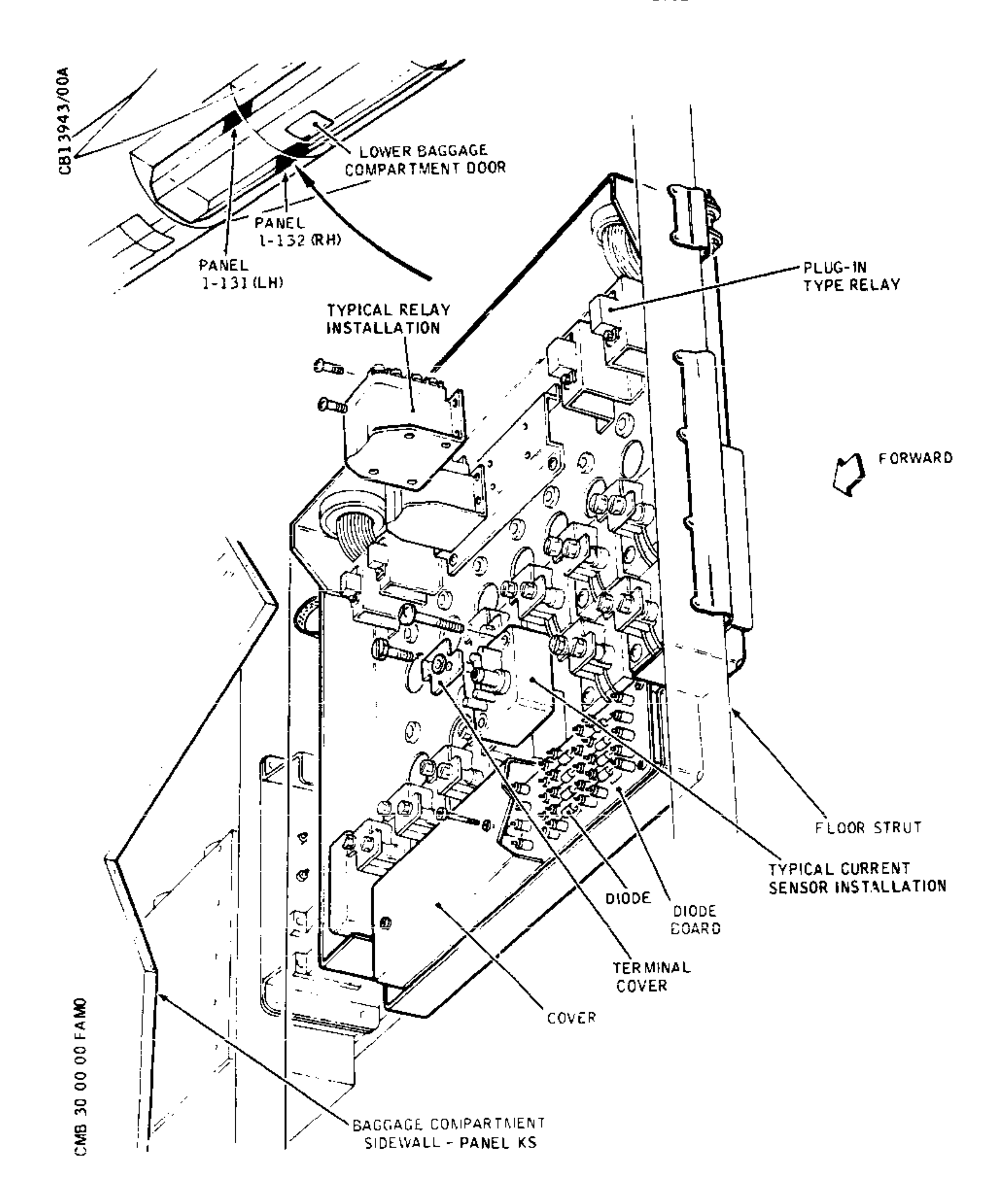
SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 1 REAR RAMP HTR SUP	14-215	1H1415	B6
LH WING SECT 13.5 & 13.6 HTRS CONTN SUP	14-215	1H371	D6
LH WING SECT 13.7 & 15.3 HTRS CONTN SUP	14-215	1H372	C6
LH WING SECT 14.1 & 14.2 HTRS CONTN SUP	14-215	1H373	C7
LH WING SECT 15.1 & 15.2 HTRS CONTN SUP	14-215	1H374	D7
LH WING FAIRING & SECT 13.1 HTRS CONTN SUP	14-215	1H403	C8
LH WING SECT 13.2, 13.3 & 13.4 HTRS CONTN SUP	14-215	1H406	D8
NO.2 T1 PROBE HEATER SUP	14-215	2H542	E8
WING 4 INT NORM CONT	15-215	1H1826	D11
LH CYCLIC NORM CONT	15-215	1H1827	F12
LH CYCLIC ALTN CONT	15-215	1H1828	F13
LH NORM CONTN CONT	15-215	1H1833	F10
LH WING ALTN CONTN CONT	15-215	1H1834	F11
WING & INTAKE NORM CONT &SUP	15-215	1H1836	D10
INT 3 AUX DOOR D BOX HTR SUP	13-216	3H1411	A10
INT 3 REAR RAMP HTR SUP	13-216	3H1415	A11
INT 4 AUX DOOR D BOX HTR SUP	14-216	4H1411	A15
INT 4 REAR RAMP HTR	14-216	4H1415	A14

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
SUP			
LH WING CONTN IND	15-216	H1511	B15
LH WING & INT 1 & 2 CYCLIC IND	15-216	H1513	B14
WING & IND ALTN CONT	15-216	2H1826	E15
WING & INT ALTN CONT & SUP	15-216	2H1836	E14
RH de-icing panel (1-132)			
INT 2 AUX DOOR D BOX HTR SUP	13-215	2H1411	A9
INT 2 REAR RAMP HTR SUP	13-215	2H1415	A10
INT 1 AUX DOOR D BOX HTR SUP	14-215	1H1411	B7
INT 1 REAR RAMP HTR SUP	14-215	1H1415	B6
RH WING CONTN IND	15-215	H1512	B11
RH WING & INT 3 & 4 CYCLIC IND	15-215	H1514	B12
WING & INT NORM CONT & SUP	15-215	1H1836	D10
INT 3 AUX DOOR D BOX HTR SUP	13-216	3H1411	A10
INT 3 REAR RAMP HTR SUP	13-216	3H1415	A11
NO.4 T1 PROBE HTR SUP	13-216	4H542	C11
INT 4 AUX DOOR D BOX HTR SUP	14-216	4H1411	A15
INT 4 REAR RAMP HTR	14-216	4H1415	A14

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
SUP			
RH WING SECT 13.5 & 13.6 HTRS CONTN SUP	14-216	2H371	C12
RH WING SECT 13.7 & 15.3 HTRS CONTN SUP	14-216	2H372	B12
RH WING SECT 14.1 & 14.2 HTRS CONTN SUP	14-216	2H373	B13
RH WING SECT 15.1 & 15.2 HTRS CONTN SUP	14-216	2H374	C13
RH WING FAIRING & SECT 13.1 HTRS CONTN SUP	14-216	2H403	B15
NO.3 T1 PROBE HTR SUP	14-216	3H542	C14
WING & INT ALT CONT	15-216	2H1826	E15
RH CYCLIC NORM CONT	15-216	2H1827	F18
RH CYCLIC ALTN CONT	15-216	2H1828	F19
RH WING NORM CONTN CONT	15-216	2H1833	F16
RH WING ALTN CONTN CONT	15-216	2H1834	F17
RH CYCLIC TIMER CONT	15-216	2H1835	D14
WING & INT ALTN CONT & SUP	15-216	2H1836	E14

(2) Open the lower baggage compartment door (Ref. 52-31-21).

(3) Gain access to the LH or RH de-icing panel (1-131 or 1-132) by removing the appropriate sidewall panel, KS (Ref. 25-52-00), in the lower baggage compartment.



\- De-icing Panel Components - Installation
Figure 406

C. Remove Relay

(1) For plug-in type relays, remove the nuts and washer securing the relay to its mounting base, and withdraw the relay from the socket.

(2) For other relays, disconnect the electrical cables from the relay terminals. Label the cables to ensure correct connection during installation.

(3) Support the relay and remove the screws securing the relay to the mounting bracket. Remove the relay from the de-icing panel.

D. Install Relay

(1) Comply with the electrical safety precautions.

(2) Check that the mounting lugs of plug-in type, 'half crystal can size' relays are at 90 deg to the relay body. Re-align the lugs as necessary.

(3) For plug-in type relays, orientate the relay, plug it into the mounting base and secure it with the nuts and washers.

(4) For other relays, position the relay on its mounting bracket so that the terminal side is uppermost. Secure the relay to the bracket with the screws.

(5) Connect the electrical cables to the relay terminals, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

E. Remove Current Sensor

(1) Remove the current sensor terminal cover and disconnect the electrical cables from the terminals. Label the cables to ensure correct connection during installation.

(2) Note the position of the current sensor on the panel, to ensure correct orientation of the sensor during installation.

(3) Remove the screws securing the current sensor to the panel and withdraw the sensor from its mounting.

F. Install Current Sensor

(1) Comply with the electrical safety precautions.

(2) Remove the current sensor terminal cover.

(3) Position the current sensor on the panel, ensuring that it is correctly orientated, and secure it with the screws.

(4) Connect the electrical cables to the terminals with the nuts and washers, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram. Torque-tighten the terminal nuts to between 8.5 and 9.5 lbf in (0.096 and 0.107 mdaN).

(5) Refit the terminal cover to the current sensor.

G. Remove Diode

(1) Remove the screws securing the diode board cover to the spacers and remove the cover from the diode board.

(2) Disconnect the diode from the mounting studs and remove the diode from the board.

H. Install Diode

(1) Comply with the electrical safety precautions.

NOTE: If the replacement diode does not have tags fitted to wire ends, the terminal tags must be crimped to the ends in accordance with the Wiring Diagram Manual, 20-42-01. Tags for diodes are as follows:- Pin 1, Solidstrand AMP 34105; pin 2, Solidstrand 34104-T006-02.

(2) Position the replacement diode so that the ring on the cathode end of the diode is pointing to terminal 2 on the diode board. Secure the tags to the mounting studs with the nuts and washers. On the size 4 stud, torque-tighten the terminal nut to between 3.0 and 3.5 lbf in (0.034 and 0.040 mdaN). On the size 6 stud, torque-tighten the terminal nut to between 6 and 7 lbf in (0.068 and 0.079 mdaN).

(3) Refit the diode board cover to the spacers and secure it with the screws.

I. Conclusion

(1) Cancel the electrical safety precautions and check the operations of the component by carrying out the appropriate test procedure.

(2) Refit the sidewall panel, KS (Ref. 25-52-00), in the lower baggage compartment.

(3) Close the lower baggage compartment door (Ref. 52-31-21).

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END OF THIS SECTION

NEXT

DE-ICING CONTROL AND INDICATION - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001, 002 and 003)
   (Ref. Fig. 004)

   Control and indication of the wing and intake de-icing is provided on a wing and intake anti-icing control panel on the pilots' roof panel, in conjunction with a diagnostic panel (fault display) at the third crew member's station.

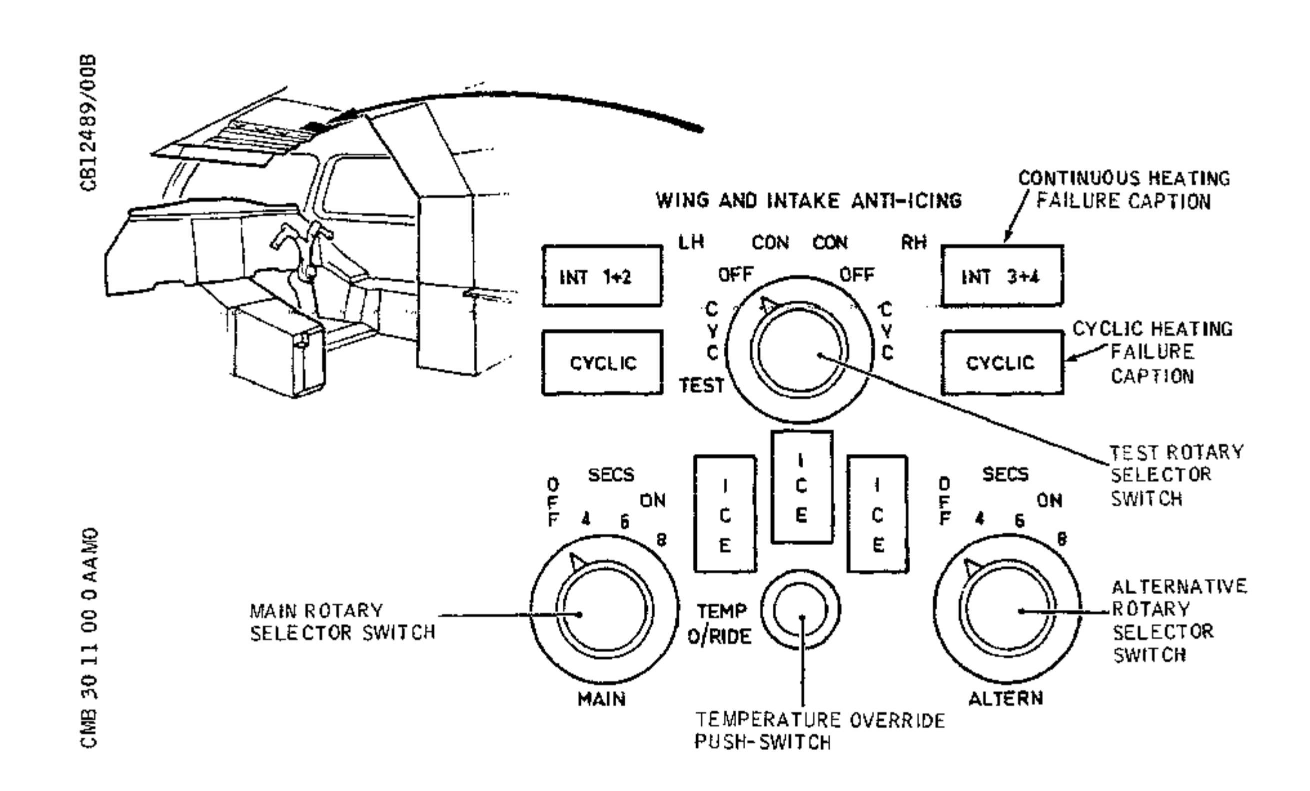
   The heating elements, which are electrical, are located in and around the engine intakes and on the wing leading edges forward of the engine intakes. The elements are formed into separate loads, which are applied either continuously or for short periods, depending on the type of heating.

   Two types of heating make up the de-icing, cyclic and continuous. Cyclic heating is effected by applying cyclically controlled a.c. power supplies to individual heating loads. Continuous heating, which is less extensive than the cyclic heating, is effected by applying continuous a.c. power supplies to a number of heating loads. The combination of cyclic and continuous heating effects controlled shedding of ice accretions in such a way that the ice particles, which may be ingested by an engine, are limited to an acceptable size.

   One of the continuously heated elements in each engine intake is exposed to an airflow only when engine air demand opens an auxiliary inlet vane. For this reason, this element is made operative only when the airflow through the vane opening is sufficient to cause icing.

   The heating loads are divided between two separate systems which encompass the left and right sides of the aircraft. These systems each consist of a cyclic and a continuous heating sub-system. Control is effected via parallel control lines, main and alternative, which are common to the left and right systems. In each control line a weight switch controlled relay (Ref. Chap.32) prevents inadvertent operation of the system on the ground, and an air data computer (ADC) slave relay (Ref. 30-31-00) prevents operation when the 'Total' temperature is above +15 deg C. A temperature override switch fitted in the alternative control line enables the ADC slave relay control to be bypassed if total temperature switching faults occur.

   The main and alternative control lines are selected by rotary selector switches engraved MAIN and ALTERN respectively.

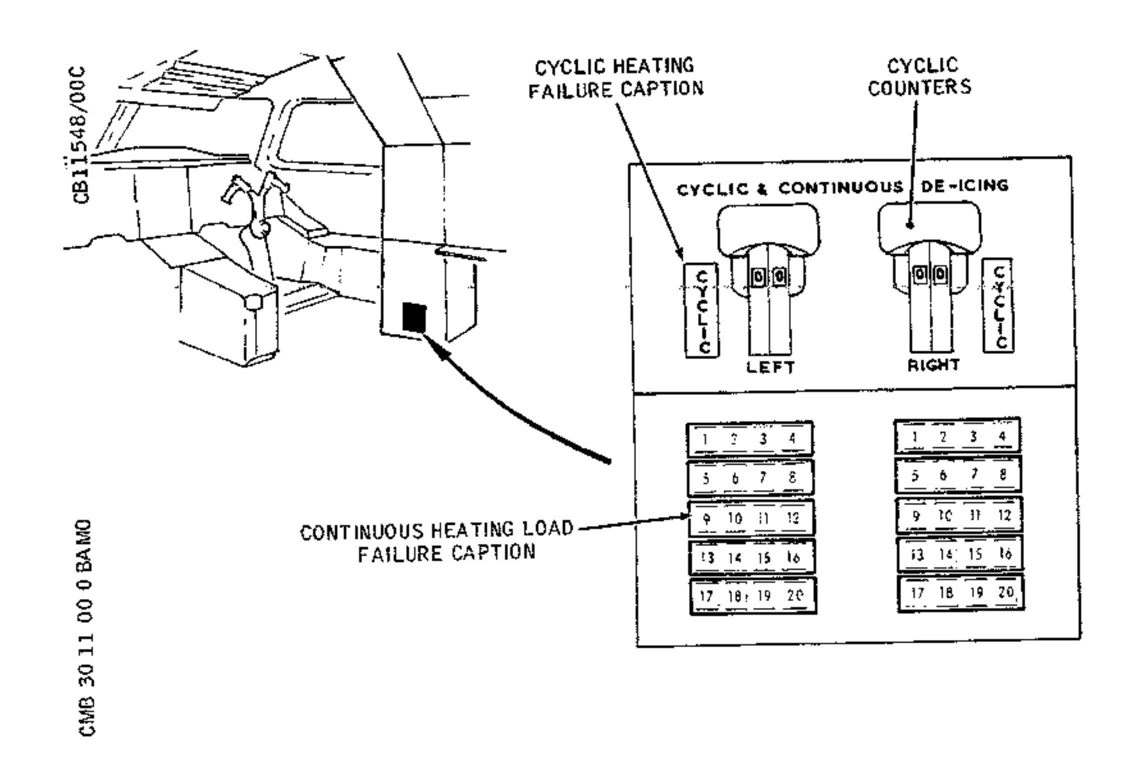


Wing and Intake De-icing - Anti-icing Control Panel
Figure 001

The system is switched on at the MAIN or ALTERN selector switch on the flight compartment roof panel, but is not activated unless the aircraft is airborne and the total temperature is below +15 deg C. When the system is activated, heating of the continuous and cyclic loads is initiated.

With the system activated, all the continuous loads are applied, except perhaps for one load in each intake, which is applied only if the associated auxiliary inlet vane is open. At the same time one cyclic load in each system is applied. Subsequently, each of the cyclic loads is applied for a set period once or more in a predetermined sequence, which is repeated until the system is de-activated. The set period each load is applied is a pulse of 4 s duration. Other pulse durations of 6 s and 8 s are available, but are not used.

De-activation occurs automatically if the total temperature



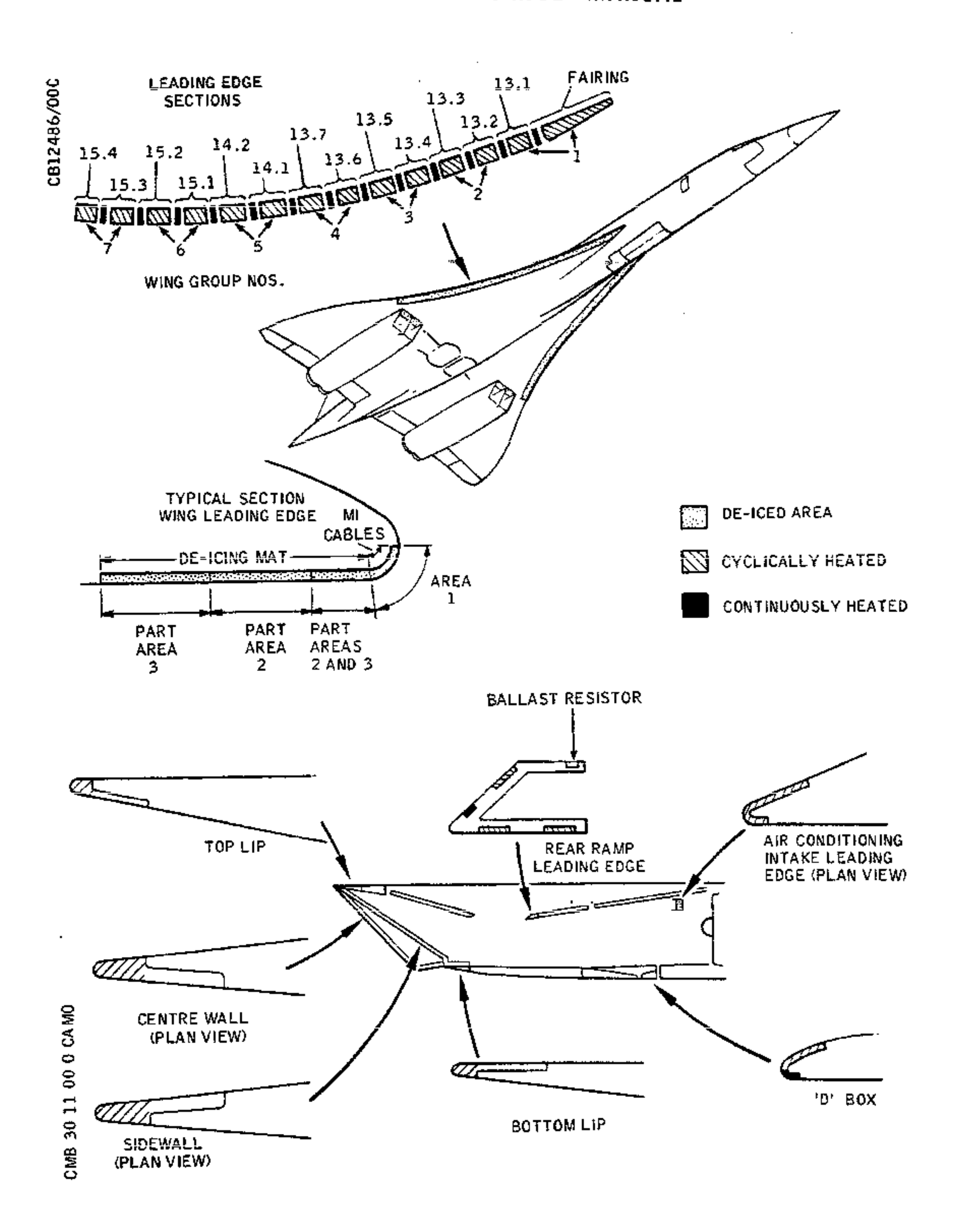
- Wing and Intake De-icing - Diagnostic Panel
R Figure 002

R rises above +15 deg C or the aircraft lands, but the
R system can be switched off any time by returning the MAIN
R or ALTERN selector switch to OFF.

Caption lights on the anti-icing control panel and diagnostic panel are equally divided between the left and right systems. The captions on the anti-icing control panel provide warning of heating malfunctions and also identify which pair of engines is potentially at risk. Certain warnings are duplicated on the diagnostic panel but other additional information is displayed, also on the diagnostic panel, in a form more readily identifiable as the area in which the failure has occurred.

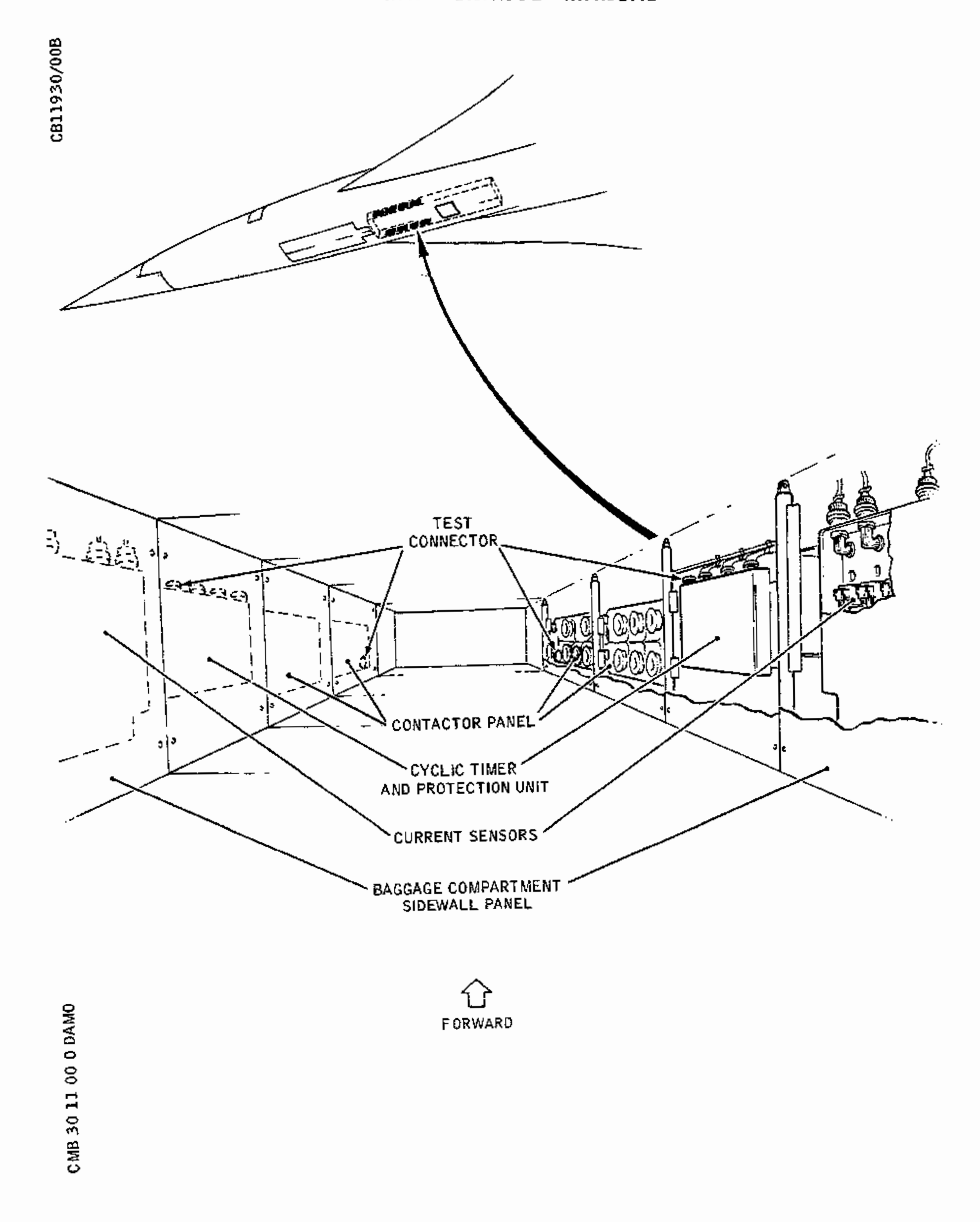
R A built-in test facility enables fast tests to be carried
R out on the individual cyclic and continuous sub-systems.

System switching functions are carried out mainly by control relays, the majority of which are contained in relay boxes (panels 13-123, 16-123, 21-123 and 23-123) which incorporate test connectors/modules to facilitate system trouble shooting



R

Location of De-iced Areas
Figure 003



R - Wing and Intake De-icing - Control Equipment
Figure 004

and testing.

2. Cyclic Timer and Protection Unit (Ref. Fig.004 and 006)

Two identical cyclic timer and protection units (CTPUs), mounted one in zone 131 and one in zone 132, effect control of the cyclic heating load sequencing and fault protection in the left and right cyclic sub-systems respectively.

Each CTPU contains, basically, sequencing circuits, positive and negative output switches, protection circuits and test cycle logic.

Load sequencing is accomplished by selecting each cyclic load once or more in a predetermined sequence of 38 pulses numbered 00 to 37 inclusive. The duration of each pulse is 4 s, and this is selected when either the main or alternative selector switch is set to the 4 SECS - ON position. In a fast test cycle a shorter pulse, of 0.5 s duration, is selected by setting the test selector switch to a cyclic test position.

Sequenced pulses energize the associated wing or intake contactors which, in turn, apply power to the appropriate cyclic heating load for the duration of the pulse. At the beginning of each sequenced pulse, a separate pulse of short duration is applied to digital cyclic counters, to indicate the appropriate pulse number.

The protection circuits cause the total inhibition of individual loads if short-term earth current faults occur. However, isolation of the complete left or right cyclic sub-system is initiated by the protection circuits if high-risk faults, such as overcurrent or prolonged current, occur.

The supply for the cyclic failure indications is controlled by the protection circuits so that if high-risk failures occur the supply is made available to provide a steady failure indication. However, if low-risk failures occur, the supply is made available only for the duration of the pulse applicable to the failed load, thereby providing an intermittent failure indication.

Test cycle logic, in conjunction with the protection circuits, produces the protective action and failure indications suitable for fast test cycles. If any kind of fault is sensed, the heating power supplies are disconnected, the programme is stopped and a steady failure indication is given. Returning the test selector switch to 'off' and then back to the test position causes the programme to go

R on to the next pulse. As a result, the protection
R circuits are reset and the test cycle is resumed.

A test connector is provided on each CTPU to enable in-situ testing to be carried out, in conjunction with a test set.

3. Diagnostic Panel (Ref. Fig. 002)

A cyclic and continuous de-icing failure diagnostic panel (8-214) is mounted on the left leg of the third crew member's management panel. The diagnostic panel enables the location of cyclic heating load failures to be determined by the
R illumination of digital cyclic counters, and the location of continuous heating load failures by the illumination of yellow numbered captions. The numbers displayed
R relate to the loads listed in Tables 1 and 2 (Ref. Fig. 003).

R Cyclic heating load failures are identified by two CYCLIC
R failure captions and two cyclic counters, one of each being
R associated with the left and right sub-systems respectively.
R Steady illumination of a CYCLIC caption and associated
R counters indicates that cyclic isolation has been effected.
Illumination for the duration of a selected pulse indicates
R a faulty cyclic load, the pulse number of which is
R indicated simultaneously by the cyclic counters; the
R numerals displayed relate to the cyclic heating leads
R listed in Table 1.

	COUNTER DISPLAY	CYCLICALLY HEATED LOAD
R		
	00, 01, 02 and 03	Inner intake - load 1 (Ref. 30-21-00)
	04	Inner intake - load 2 (Ref. 30-21-00)
R R	05	Inner and outer intake - load 3 (Ref. 30-21-00)
	06	Inner intake - rear ramp
	21	Inner intake - 'D' box
	07, 08, 09 and 10	Outer intake - load 1 (Ref. 30-21-00)
	11	Outer intake - load 2 (Ref. 30-21-00)

R	COUNTER DISPLAY	CYCLICALLY HEATED LOAD
	12	No load - see No Load Warning Inhibition
R		(Ref. para.26.B.(5))
	13	~~Outer intake - rear ramp~~
	22	Outer intake - 'D' box
	23	Wing group 1 - area 1
	24	Wing group 1 - area 2
	25	Wing group 2 - area 1
	26	Wing group 2 - area 2
	27	Wing group 3 - area 1
	28	Wing group 3 - area 2
	29	Wing group 4 - area 1
	30	Wing group 4 - area 2
	14 and 31	Wing group 5 - area 1
	15	Wing group 5 - area 2
	32	Wing group 5 - area 3
	16 and 33	Wing group 6 - area 1
	17	Wing group 6 - area 2
	34	Wing group 6 - area 3
	18 and 35	Wing group 7 - area 1
	19	Wing group 7 - area 2
	36	Wing group 7 - area 3
	20 and 37	Blank pulses

R Diagnostic Panel - Cyclic Counters and
R Associated Cyclically Heated Loads

	COUNTER DISPLAY	CYCLICALLY HEATED LOAD
R		

Table 1

Two groups (left and right systems) of 18 yellow captions, numbered 1 to 18 inclusive, are provided for the identification of continuous heating load failures. However, only 10 out of each group of 18 captions are actually used for failure indication, the remaining 8 being spare. When illuminated, the captions display numbers related to the continuous heating loads detailed in Table 2 (Ref. Fig. 003).

Four additional captions, white and numbered 19 and 20 for the left and right systems, are also not used.

	LH/RH CAPTION	COLOUR	CONTINUOUSLY HEATED LOAD
R	1	Yellow	Wing fairing and section 13.1
R	2	Yellow	Wing sections 13.2, 13.3 and 13.4
R	3	Yellow	Wing sections 13.5 and 13.6
R	4	Yellow	Wing sections 13.7 and 15.3
R	5	Yellow	Wing sections 14.1 and 14.2
R	6	Yellow	Wing sections 15.1 and 15.2
R	7	Yellow	Intakes 1 and 3, rear ramp
R	8	Yellow	Intakes 2 and 4, rear ramp
R	9	Yellow	Intakes 1 and 3, 'D' box
R	10	Yellow	Intakes 2 and 4, 'D' box
	11	Yellow	Not used
	12	Yellow	Not used
	13	Yellow	Not used
	14	Yellow	Not used

R	LH/RH CAPTION	COLOUR	CONTINUOUSLY HEATED LOAD
	15	Yellow	Not used
	16	Yellow	Not used
	17	Yellow	Not used
	18	Yellow	Not used
	19	White	Not used
	20	White	Not used

Diagnostic Panel = Numbered Captions and Associated Continuously
R Heated Loads
Table 2

4. Main Control Relay (Ref. Fig. 005)

A main control relay, mounted on panel 13-123, in conjunction with a left weight switch relay and No.1 ADC slave relay, effects control of the main control line.

R The relay is energized when the system is selected 'on' at
R the main selector switch. Energization of the relay arms
R but does not activate the cyclic and continuous heating.

5. Alternative Control Relay (Ref. Fig. 005)

An alternative control relay, mounted on panel 16-123, in conjunction with a right weight switch relay and No.2 ADC slave relay or a temperature override relay, effects control of the alternative control line.

R The relay is energized when the system is selected 'on' at
R the alternative selector switch. Subsequent operations
are similar to those described for the main control relay.

6. Temperature Override Relay (Ref. Fig. 005)

A temperature override relay, mounted on panel 16-123, provides a control circuit to bypass the control of No.2 ADC slave relay in the alternative control line. Control of the relay is effected by a temperature override push-switch on the anti-icing control panel.

The relay is normally de-energized, and is only utilized
R during flight to override possible fault conditions in
R the associated total temperature switching. When energized
the relay remains latched until the alternative selector
switch is returned to the OFF position.

7. Three-phase Current Transformer (Ref. Fig. 006)

Two three-phase current transformers, mounted one on panel
R ~~24-215 and one on panel 24-216, sense the individual phases~~
R of the supplies to the cyclically controlled loads in the
R left and right sub-systems respectively. No-current,
unbalanced current, prolonged current or overcurrent
conditions are detected by associated protection circuits
in the CTPUs.

8. Three-phase Contactor (Ref. Fig.006 and 007)

Two three-phase contactors, one mounted on panel 24-215
R and one on panel 24-216, connect the heating power supplies
to the left and right cyclically controlled loads
respectively.

The contactors are normally energized by the appropriate
R CTPU when the system is activated. Any subsequent detection
R of high risk faults by a protection circuit results in
R de-energization of the contactor supplying the faulty sub-
R system. If the fault condition remains in excess of
1 s an associated cyclic isolation locking relay prevents
the contactor from being reselected other than by a cyclic
reset facility.

9. Earth Current Transformer (Ref. Fig. 006)

R Two earth current transformers, mounted one in zone 125 and
one in zone 126, sense the three-phase supplies to the
R cyclically controlled loads in the left and right sub-
systems respectively. Earth current leakage conditions
produce output signals which are applied to the protection
circuits in the appropriate CTPU.

10. Single-phase Current Transformer (Ref. Fig. 006)

Two single-phase current transformers, mounted one on panel
2-131 and one on panel 2-132, produce output signals which
are applied to the protection circuits in the appropriate
CTPU when associated current transformer changeover relays
are selected. These transformers provide the necessary
R signals to prevent the failure indications which would be
R initiated by a two-phase load.

11. Current Transformer Change-over Relay (Ref. Fig. 006)

Two current transformer change-over relays, mounted one on panel 1-131 and one on panel 1-132, effect control of the left and right single-phase current transformers respectively.

Each relay is selected whenever associated two-phase cyclic loads are applied. When energized the relay causes the output of the associated single-phase current transformer to be summed with the output of the system three-phase current transformer to simulate a three-phase signal input to the CTPU protection circuits.

12. Test Connector (Ref. Fig. 006)

Two test connectors, located one on panel 3-131 and one on panel 3-132, provide access to the three-phase feeder lines of the heating power supplies in the left and right cyclic sub-systems respectively.

13. Switch Units (Ref. Fig. 006)

Four switch units, one for each engine intake, are mounted one each in zones 411, 421, 431 and 441.

Each unit houses eight three-pole intake contactors. The contactors, some of which are not used, are designated alphabetically. The contactors in use are energized in sequence upon receipt of sequenced pulses from the associated CTPU, and apply power to the appropriate heating load for the duration of the pulse. The cyclically heated areas, together with the associated contactors, are shown in Table 3.

ELEMENT LOCATION	AREA/LOAD	CONTACTOR DESIGNATION
Top lip, bottom lip and rear ramp ballast resistor	Load 1	G
Top lip, bottom lip	Load 2	E
Centre wall, sidewall (inner intake switch units only)	Load 3	F

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R	ELEMENT LOCATION	AREA/LOAD	CONTACTOR DESIGNATION
R	Air conditioning intake, rear ramp	Load 4	L
R	'D' box	Load 5	J

Intake Contactors
Table 3

R 14. Wing Contactors (Ref. Fig. 006)

R Thirty-four wing contactors connect the power supplies to the heating elements in the wings as shown in Table 4.

ELEMENT LOCATION	CONTACTOR QUANTITY	CONTACTOR LOCATION
LH wing area		
Group 1	2	3-131
Group 2	2	2-131
Group 3	2	2-131
Group 4	2	2-131
Group 5	3	2-131
Group 6	3	3-131
Group 7	3	3-131
RH wing area		
Group 1	2	3-132
Group 2	2	2-132
Group 3	2	2-132

ELEMENT LOCATION	CONTACTOR QUANTITY	CONTACTOR LOCATION
Group 4	2	2-132
Group 5	3	2-132
Group 6	3	3-132
Group 7	3	3-132

R Wing Contactors
Table 4

The seventeen contactors supplying each wing are energized in sequence upon receipt of pulsed control signals from the associated CTPU, and power is applied to the appropriate heating elements for the duration of the pulse.

R 15. Cyclic Starter Relay (Ref. Fig. 007)

Two cyclic starter relays, mounted one on panel 13-123 and one on panel 16-123, effect control of the left and right cyclic isolation locking relays respectively.

R Each relay is selected if the protection circuits sense a
R high-risk fault and de-energize the three-phase contactor.
R A 1 s delay on energization is provided to ensure that the
R associated cyclic isolation locking relay is neither
R energized nor latched 'off' at switch-on.

R 16. Cyclic Isolation Locking Relay (Ref. Fig. 007)

Two cyclic isolation locking relays, mounted one on panel 13-123 and one on panel 16-123, effect control of the three-
R phase contactors in the left and right sub-systems respectively.

Both relays are normally de-energized with the contacts in the closed ('reset') position, and are energized to open
R the contacts only if a fault condition is confirmed by associated cyclic starter relays. Once energized each relay remains magnetically latched 'off', thereby isolating the appropriate three-phase contactor.

The relays can be reset by energizing integral 'reset' coils.
R Each 'reset' coil is controlled by a press-to-reset

facility of a CYCLIC failure caption.

17. Warning Inhibition Relay (Ref. Fig. 009)

Two warning inhibition relays are mounted one on panel 1-131 and one on panel 1-132. Each relay inhibits the no-current protection circuits in the associated CTPU whenever a certain combination of the CTPU output switches is selected. This particular switch combination would normally produce a failure indication, because there is no contactor connected to it. Thus spurious failure indications are prevented by the action of the relay.

18. Continuous Heating Control Relay (Ref. Fig.010 and 012)

Ten continuous heating control relays are mounted three each on panels 13-123 and 16-123, and two each on panels 1-131 and 1-132. The relays effect control over the a.c. power supplies to the continuously heated elements.

Six of the relays are associated with the heaters in the
R wings and intake rear ramps and are energized whenever the
R system is activated or, for a limited period only, when a
R continuous heating fast test is carried out.

The remaining four relays are associated with the 'D' box heaters in the engine intakes, and are additionally controlled by continuous heating control microswitches. Because of this, each relay is energized only when the
R associated auxiliary inlet vane is open more than 7.5 deg, provided the system is activated or undergoing a continuous heating test cycle.

19. Continuous Heating Indication Relay (Ref. Fig. 012)

Four continuous heating indication relays are mounted two on panel 1-131 and two on panel 1-132. The relays operate in conjunction with continuous heating indication micro-switches, and effect control over the failure indication circuits of the 'D' box continuous heating.

Each relay is energized whenever the associated auxiliary
R inlet vane is open more than 7.5 deg, provided the system is activated or undergoing a continuous heating test cycle.

20. Continuous Heating Control Microswitch (Ref. Fig. 012)

Four continuous heating control microswitches are mounted one on each engine intake spill door. The microswitches provide an additional control over the 'D' box continuous heating control relays.

The microswitch in each intake is mounted in a bracket alongside an associated continuous heating indication microswitch. An operating mechanism (Ref. 71-64-00) closes both switches when the auxiliary inlet vane is open more than 7.5 deg.

21. Continuous Heating Indication Microswitch (Ref. Fig. 012)

Four continuous heating indication microswitches are mounted one on each engine intake spill door. The microswitches operate in conjunction with continuous heating indication relays, and effect control over the failure indication circuits of the 'D' box continuous heating.

The microswitch in each intake is mounted in a bracket alongside an associated continuous heating control microswitch. An operating mechanism (Ref. 71-64-00) closes both switches when the auxiliary inlet vane is open more than 7.5 deg.

22. AC Current Sensor (Ref. Fig.010 and 012)

Twenty a.c. current sensors, mounted ten on panel 1-131 and ten on panel 1-132, are interposed in the supply lines to the continuously heated elements to sense the input to each load.

The power to the associated load is applied via a transformer in each sensor which energizes an integral relay. Contacts of this relay effect control of the continuous heating failure warning captions on the anti-icing control panel and the diagnostic panel.

23. Retest Time Delay Relay (Ref. Fig. 013)

Two retest time delay relays (2.5 min delay on de-energizing), one on panel 13-123 and one on panel 16-123, are provided to ensure that the heating elements are given adequate time for cooling between tests of the continuous heating sub-systems.

The appropriate retest time delay relay is selected when the continuous heating test selections are made. Once selected the relay will remain energized for 2.5 min, thus maintaining an associated continuous time delay test relay energized and preventing reselection of the test circuit until 2.5 min have elapsed.

24. Continuous Time Delay Test Relay (Ref. Fig. 013)

Two continuous time delay test relays (3 s delay on energizing), one on panel 13-123 and one on panel 16-123,

are provided to ensure that, during testing, power is applied to the continuous heating elements for a nominal period of 3 s only, thus preventing overheating and subsequent damage.

The appropriate continuous time delay test relay is selected by the associated retest time delay relay when a continuous heating test selection is made. Three seconds after selection the relay becomes energized, thereby removing the supplies from the elements under test by de-energizing the continuous heating control relays. A hold-on circuit ensures that the relay remains latched until the test selection is cancelled.

R 25. Continuous Override Test Time Delay Relay (Ref. Fig. 013)

Two continuous override test time delay relays (6 s delay on energizing), one on panel 13-123 and one on panel 16-123, are provided to ensure that power is removed from the continuous heating elements under test if a failure of the continuous time delay test relay occurs.

The relay is energized 6 s after a test selection is made, and an additional break is made in the supply line to the
R continuous heating control relays; in addition, the associated indication circuits are inhibited.

R 26. Operation

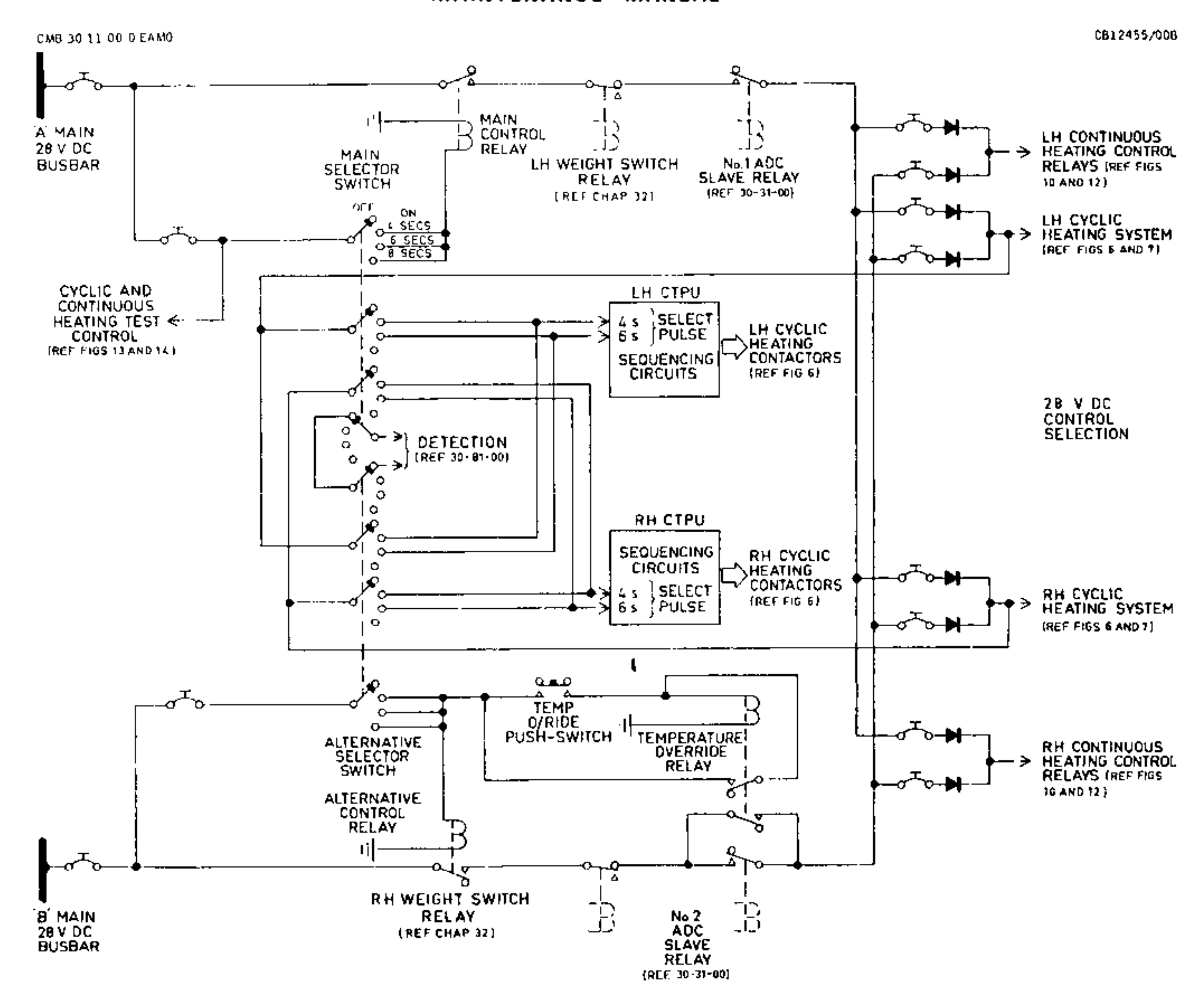
A. Control and Indication (Ref. Fig.001 and 002)

All the de-icing controls and indicators, with the exception of those on the diagnostic panel, are located on the anti-icing control panel in the flight compartment roof. The diagnostic panel is located on the left leg of the third crew member's management panel.

All filaments can be dimmed or tested by associated switches (Ref. 33-14-00).

R Primary control over the system in the operating mode
R is by the use of either one of two rotary selector
R switches, marked MAIN and ALTERN. The switches are
R used on alternate flights and provide back-up for
R each other in the event of a supply or equipment
R failure.

R A MAIN 4-position (OFF, 4 SECS - ON, 6 SECS - ON and
R 8 SECS - ON) rotary selector switch is used to switch
R the system on. Use of the 6 SECS - ON and 8 SECS - ON
R switch positions has been discontinued, although both
R are still operative, therefore if the de-icing is



- Control Selection - Simplified Schematic
Figure 005

R

required to be switched on, the 4 SECS - ON position is selected. However, although the system will be switched on, it will not be activated unless the aircraft is airborne and the total temperature falls below +15 deg C. With the system activated, the cyclic and continuous heating is initiated. As indicated by the switch marking, the cyclic heating operates with 4 s pulses.

An ALTERN 4-position (OFF, 4 SECS - ON, 6 SECS - ON and 8 SECS - ON) rotary selector switch is used to switch the system on. The switch is used in the same way as the MAIN selector switch, but on alternate flights. This switch is used in conjunction with a TEMP O/RIDE switch when overriding total temperature switching faults.

A TEMP O/RIDE push-switch, in conjunction with the ALTERN selector switch, enables total temperature switching faults, which result in interruption of the system control lines, to be overridden.

A TEST 6-position (LH CYC, LH OFF, LH CON, RH CON, RH OFF, RH CYC) rotary selector switch in conjunction with built-in test equipment, enables pre-flight tests and fault identification checks to be made.

Two continuous heating failure warning yellow captions, INT 1+2 and INT 3+4, are mounted on the anti-icing control panel. Illumination of a caption indicates a failure in the associated continuous heating sub-system and identifies the engines potentially at risk; the failed area is determined by observing the diagnostic panel.

Two yellow CYCLIC captions, each with a press-to-reset facility, are located on the anti-icing control panel. Each caption provides warnings of cyclic heating failures and can be used to reinstate the associated cyclic sub-system after isolation. Steady illumination indicates a complete failure of the related cyclic sub-system and automatic isolation of the cyclic loads. Intermittent illumination of a caption indicates a partial failure of the system; the failed area is determined by observing the diagnostic panel.

Two yellow CYCLIC captions on the diagnostic panel duplicate the warnings given by the CYCLIC captions on the anti-icing panel. Illumination of a caption is accompanied by illumination of adjacent cyclic counters; the numerals displayed relate to specific cyclically heated areas (Ref. Table 1).

Illumination of one or more of the numbered yellow captions on the diagnostic panel indicates in which area the continuous heating has failed (Ref. Table 2).

Illumination of an INT 1+2, INT 3+4 or CYCLIC caption with the system switched off could mean that a continuous heating control relay or three-phase contactor is in the energized position. As this could damage the associated heating elements, the heating power supplies must be removed as soon as possible.

B. Functional Description

(1) Control Selection (Ref. Fig. 005)

On the ground, associated LH and RH weight switch relays are energized to prevent inadvertent operation of the system. When the aircraft becomes airborne these inhibitions are automatically removed.

In flight, when the total temperature falls below +15 deg C, associated ADC temperature sensing systems energize Nos.1 and 2 ADC slave relays, thus permitting subsequent activation of the system.

Setting either the MAIN or ALTERN selector switch to the 4 SECS - ON position switches the system on by energizing the appropriate control relay. Subsequently, with the weight switch and total temperature inhibitions removed, a control selection supply causes activation of the left and right cyclic and continuous heating.

Normally a 28 V d.c. supply is applied to the CTPUs for internal power supplies whenever power is made available on the aircraft. The CTPUs remain dormant until such time as the control selection supply becomes available, in which case the protection circuits energize the integral relays thus activating the cyclic heating.

The control selection supply activates the continuous heating directly, by energizing or arming the continuous heating control relays.

If the system is de-activated by a failure in the associated total temperature switching circuits, it may be reactivated by first selecting the

ALTERN selector switch to the 4 SECS - ON position and then pressing the TEMP O/RIDE push-switch. Pressing this switch energizes the temperature override relay, the contacts of which complete an alternative control line in parallel with normally-open contacts of No.2 ADC slave relay and also provide a hold-on circuit to maintain the temperature override relay energized. The No.2 ADC slave relay contacts remain 'bypassed' until the ALTERN selector switch is returned to the OFF position.

The associated ice detector systems (Ref. 30-81-00) initiate visual and audible warnings if activated with this system switched off at the MAIN and ALTERN selector switches. The supplies for activating the warnings are routed through series-connected 'off' contacts of each selector switch, and also through parallelled contacts of the control switches of
R all four engine anti-icing systems (Ref. Chap.75). In order
R to cancel the master warnings for LH detection the system
R must be switched on at the MAIN or ALTERN selector switch.
R For RH detection the system must be switched on at the MAIN
R or ALTERN selector switch, and the four engine anti-icing
R systems at their respective control switch. The main warnings provided are the illumination of a master warning red ICE caption and the sounding of the audible warning single-stroke gong. Additionally, an ice detector system red ICE caption is illuminated.

NOTE: As the functioning of the various sub-systems is similar the following operations describe the left sub-system and only one intake (No.1).

(2) Cyclic Timing, Protection and Testing (Ref. Fig. 006)

Each CTPU controls a direct three-phase a.c. supply to the wing and intake cyclic heating loads via a system three-phase contactor which, in conjunction with the CTPU protection circuits, provides the necessary control of the heating power supplies. The a.c. supplies are applied to the cyclic loads via contactors, which are individually energized in a predetermined sequence for defined periods of time, namely 0.5 s or 4 s. The 0.5 s period is selected when a cyclic heating test selection is made, and the 4 s period is selected at the MAIN or ALTERN selector switch.

The CTPU main d.c. power unit is supplied direct from a 28 V d.c. busbar and, provided a high-risk fault is not present, supplies the logic and clock power units when the system is activated or when a cyclic test selection is made. Two additional supplies are applied to the CTPU. One activates the protection circuits and the other provides a supply for the illumination of associated failure warning indications.

Timing functions are derived from a single clock which produces 10 ms pulses for the sequencing circuits. The clock pulses are processed by the sequencing circuits into -

(a) signal pulses of 0.5 s, 4 s, 6 s or 8 s duration, depending on the mode selected.

(b) blanking pulses of 120 ms duration, which are produced at the beginning of each signal pulse, and

(c) count and reset signals for the associated cyclic counters.

The signal pulses are formed into an output programme corresponding to 38 signal pulses numbered 00 to 37 inclusive. This output programme is applied to four positive and seven negative output switches in such a manner that at any one time only one positive and one negative output switch is selected. To ensure a suitable pulse interval, the 120 ms blanking pulse is applied to all seven negative output switches at the beginning of each signal pulse. On completion of a programme of 38 signal pulses the circuits are reset and the programme is repeated.

The wiring between the positive and negative output switches and the wing and intake contactor coils forms a matrix. The matrix is provided to ensure that each contactor is energized by one pair of output switches only. Some pairs of output switches are selected more than once in each output programme. One example of this is P2/N2, which is selected for pulses 00, 01, 02 and 03, thereby energizing the same contactor four consecutive times. In such cases the necessary interval between pulses is still maintained by a blanking pulse.

Each of the output switch pairs can be separately inhibited following a specific inhibit command from the protection circuits.

The count signals produced in the sequencing circuits drive the cyclic counters on the diagnostic panel from pulse number 00 to 37 inclusive. Each pulse number displayed relates to one of the cyclic loads detailed in Table 1. At the beginning of each programme a train of reset pulses returns the cyclic counters to zero.

On activation the protection circuits energize integral relays, which in turn -

(a) inhibit the cyclic failure warnings,

(b) energize the system three-phase contactor via the normally-closed ('reset') contacts of a cyclic isolation locking relay (operation of this relay is described later), and

(c) activate a clock power unit and a logic power unit.

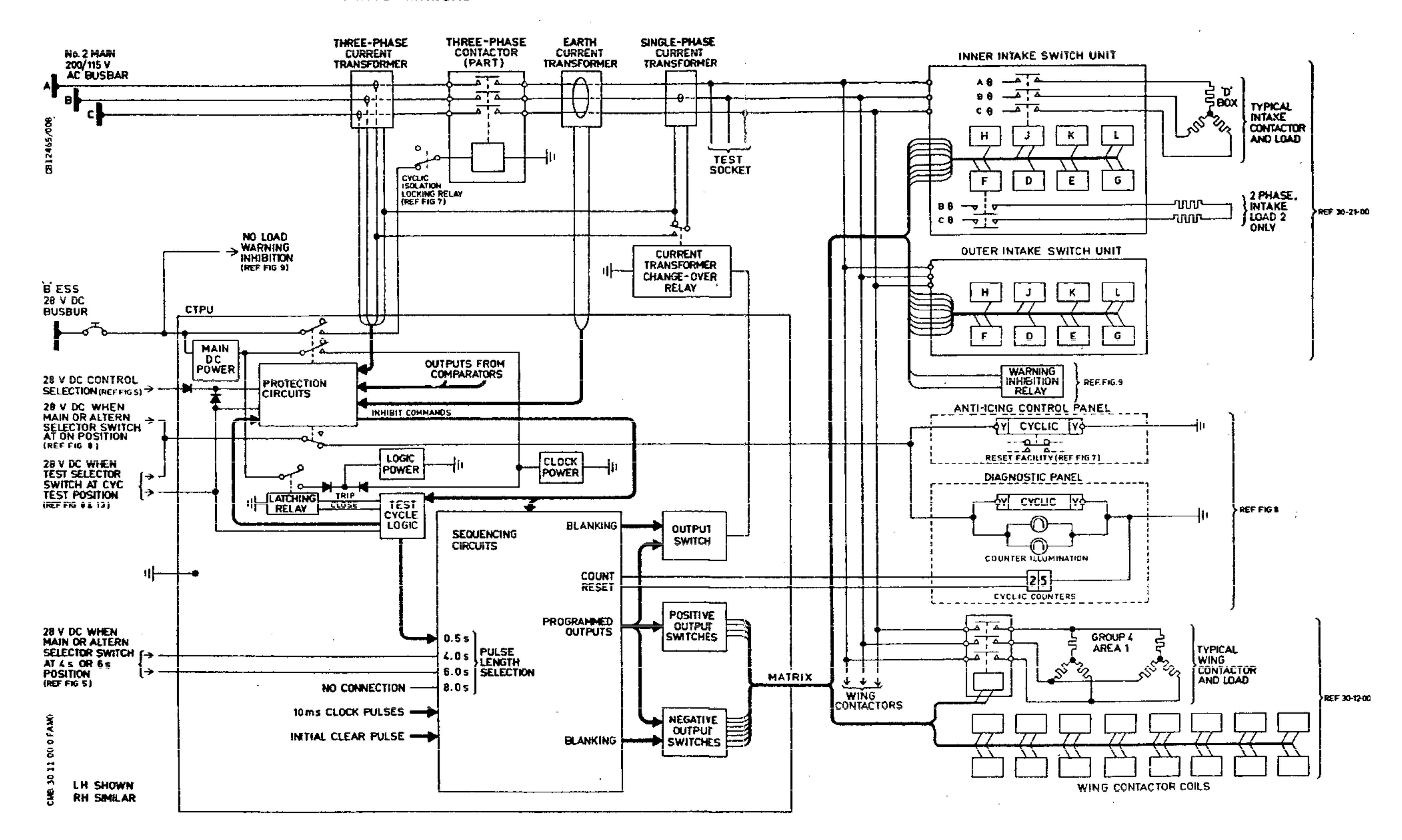
With the clock power unit activated, 10 ms clock pulses are applied to the sequencing circuits. Application of power to the logic power unit activates the logic of the protection and sequencing circuits.

When power is first applied to the logic power unit an initial clear pulse is applied to all logic circuits to ensure that the output programme commences with pulse 00. At the same time a train of reset pulses returns the cyclic counters to zero.

Subsequent to switch-on the protection circuits provide, where necessary, cyclic failure warnings and inhibitions in the following ways:

(a) The signal pulses are duplicated in the sequencing circuits. The resulting signal and the main signal are applied to a comparator. If the signals are not identical the comparator applies a failure signal to the protection circuits which initiate cyclic isolation and steady illumination of the associated CYCLIC failure captions and cyclic counters.

INTENTIONALLY BLANK



- Cyclic Timing, Protection and Testing -
Simplified Schematic
Figure 006

R

(b) The output side of each positive and negative output switch (which includes the matrix wiring) is also connected to a comparator. If this comparator senses two positive or two negative output switches on together, indicating a short circuit, a signal is applied to the protection circuits and failure action is initiated as in (a) above.

(c) Abnormal current conditions in the three-phase heating supplies are sensed by the protection circuits and the associated current transformers. The following actions are implemented depending on the current conditions prevailing:-

c1)	No current	- CYCLIC failure captions and cyclic counters are illuminated for the duration of the appropriate pulse.
c2)	Unbalanced current	- as in c1) above except when specific two-phase loads are selected (these conditions are described later).
c3)	Earth current	- appropriate switch combination is inhibited until system is switched off. The resulting no-current condition is detected by the protection circuits, and indication is given as in c1) above.
c4)	Overcurrent	- cyclic isolation is initiated, i.e., the system three-phase contactor is de-energized and the cyclic isolation locking relay is latched in the 'off' position. The CYCLIC captions and the stationary cyclic counters are illuminated continuously.

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c5) Prolonged earth current - as in c3) above unless inhibition fails to nullify the fault; then action as in c4) above.

c6) Prolonged current - as in c4) above.

The failure action resulting from selection of a specific two-phase load would normally consist of failure indication as for either an unbalanced current condition or a no-current condition. To prevent this from happening, when either pulse 4 or pulse 11 is selected the following changes take place to alter the unbalanced current input to the protection circuits. Coincident with selection of the appropriate switch combinations, a separate output switch is activated. This switch energizes an associated current transformer change-over relay which in turn causes the output of a single-phase current transformer to be summed with the output of the system three-phase current transformer. Thus the input to the protection circuits will appear as a normal balanced current input, and failure action will not be initiated. Subsequent failures of the two-phase load will be detected as for a no-current failure.

The no-current failure indications that would normally result from selection of blank pulses 20 or 37 are automatically inhibited by the CTPU whenever the appropriate switch combination is selected.

Built-in test circuits enable the operation of each cyclic sub-system to be tested on the ground. The test is initiated by selection of a CYC test position of the TEST selector switch on the anti-icing control panel. The resulting test cycle control supply is applied to the CTPU to initiate the test, and also to the cyclic isolation locking relay to prevent cyclic isolation.

On receipt of the test cycle control supply, test cycle logic initiates a fast single-cycle output programme in which each signal

pulse has a duration of 0.5 s. In addition the time delays associated with prolonged current and unbalanced current in the protection circuits are modified to accept the fast cycle.

Subsequently, if a fault is detected by the protection circuits the output programme is stopped and the protection circuit integral relays are de-energized. As a result, the associated CYCLIC failure captions and cyclic counters are illuminated and the system three-phase contactor is de-energized to remove the power supply from the affected load. In this condition an integral latching relay maintains the 28 V d.c. supply to the logic power unit which 'holds' the cyclic sequence until test cycle reset action is taken. The affected pulse number is highlighted by illumination of the cyclic counters.

Test cycle reset action is carried out by first selecting the TEST selector switch to an OFF position and then returning it to the required CYC test position. This action trips the test cycle logic latching relay and removes the 28 V d.c. supply from the logic power unit. In this condition the test cycle is recommenced at the next pulse number. Due to the possibility of a high-risk fault being on a common feeder line, the test should be terminated if reset action is required for
R five consecutive pulses. Otherwise there is
R no limit to the number of times reset action
R is carried out.

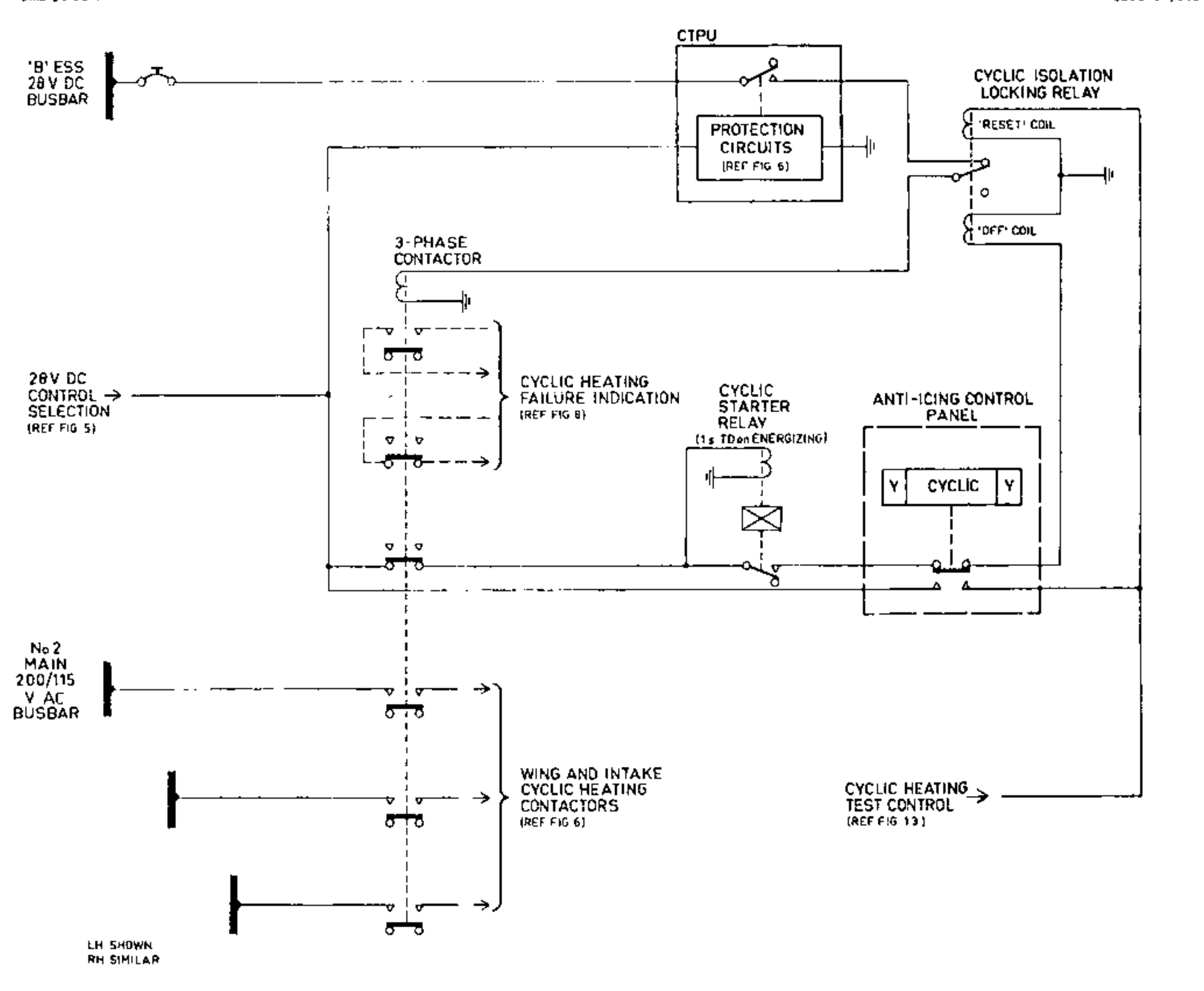
On completion of the sequence the CYCLIC failure captions and cyclic counters are illuminated, the counters are reset to zero and the test cycle is automatically terminated.
R The captions and counters will remain illuminated
R until the TEST selector switch is returned to the
R nearest OFF position.

R In order to avoid damaging the heating elements,
R at least 1 min must be allowed to elapse before
R the switch is returned to the same CYC test
R position for a retest.

(3) Cyclic Isolation and Cyclic Reset (Ref. Fig. 007)

CMB 30 11 00 0 GAMO

CB12457/008



- Cyclic Isolation and Cyclic Reset -
Simplified Schematic
Figure 007

R

EFFECTIVITY: ALL

BA

When the system is activated a control selection supply is applied to the CTPU which, in turn, energizes the three-phase contactor via the CTPU integral relay contacts and the normally-closed ('reset') contacts of a cyclic isolation locking relay.

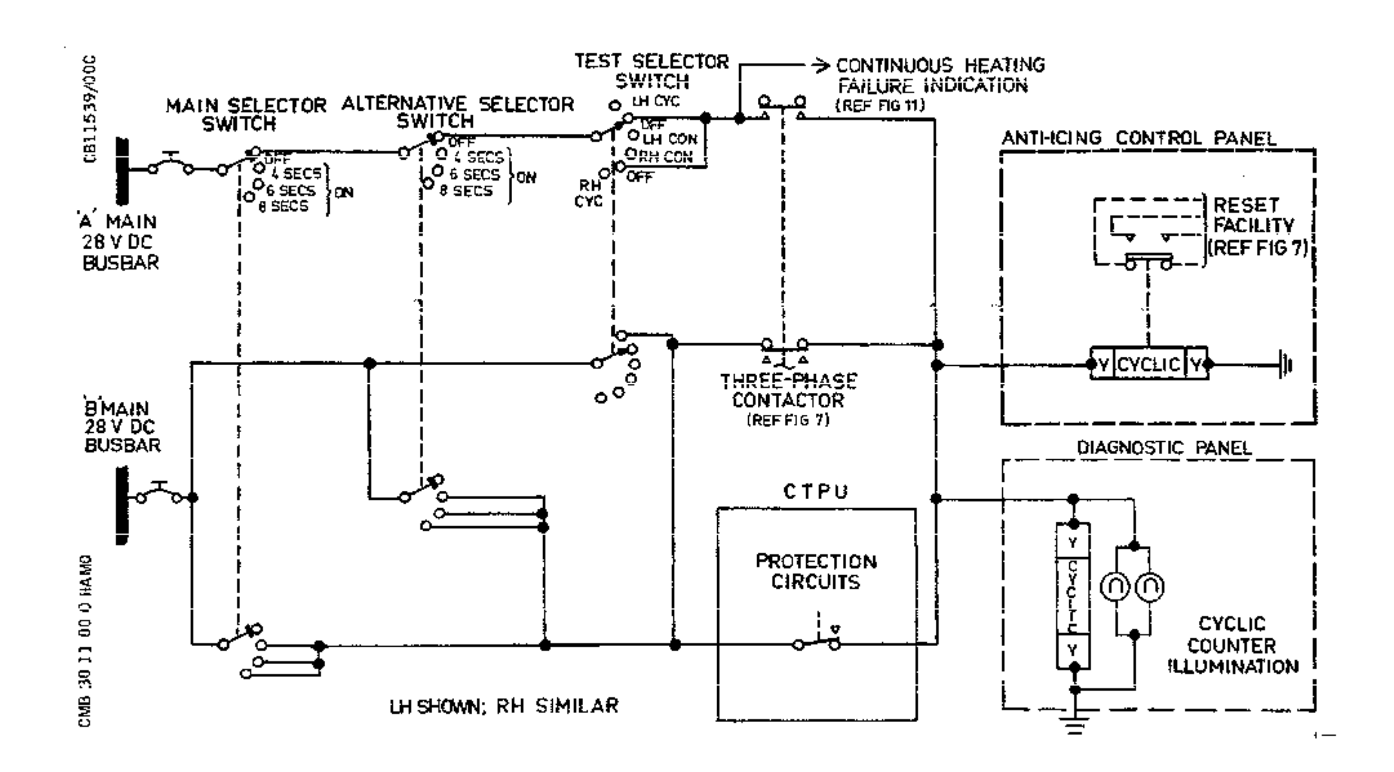
In the event of the three-phase contactor being de-energized, either by a failure in the contactor itself or by operation of the CTPU protection circuits, cyclic isolation is initiated. First, power is applied to a cyclic starter relay, which becomes energized after a delay of 1 s. Then a supply is applied via the normally-closed contacts of a combined CYCLIC failure caption and reset switch to latch the cyclic isolation locking relay in the 'off' position. In this configuration cyclic isolation is complete, i.e., the relay interrupts the supply line to the three-phase contactor and prevents reselection of the cyclic loads until an attempt is made to manually reset the system.

To reset the system manually, the selector switch must first be returned to the 'off' position, then once again set to the 4 SECS - ON position. The cyclic counters must be observed to reset to zero and then start counting. Only if these conditions are met can the CYCLIC caption be pressed in an attempt to reinstate the system. When the cyclic caption is pressed the 'reset' coil of the cyclic isolation relay is energized and the three-phase contactor closes, which, in turn, connects the heating power supplies up to the cyclic heating contactors and also interrupts the supply to the cyclic starter relay and the 'off' coil of the cyclic isolation locking relay. If the fault condition persists, the cyclic isolation locking relay is once again latched in the 'off' position when the caption reset switch is released.

When a CYC test position has been selected at the TEST selector switch, a supply is applied to the reset coil of the cyclic isolation locking relay to inhibit the cyclic isolation circuit for the duration of the test.

(4) Cyclic Heating Failure Indication (Ref. Fig. 008)

When a MAIN, ALTERN or TEST switch is selected 'on', a power supply is applied to normally-



Cyclic Heating Failure Indication - Simplified Schematic
Figure 008

closed 'cyclic inadvertent off' contacts of the three-phase contactor and the cyclic protection circuit integral relay contacts. Provided the system is operating correctly both sets of contacts will open thus inhibiting the associated cyclic failure warnings. Failures resulting in de-energization of the three-phase contactor illuminate the cyclic failure warnings steadily; failures detected by the cyclic protection circuits illuminate the cyclic failure warnings for the duration of the appropriate signal pulse only.

If a three-phase contactor fails to de-energize when the system is switched off, a supply is routed through normally open 'cyclic inadvertent on' contacts of the three-phase contactor to provide a steady cyclic failure warning.

(5) No-load Warning Inhibition (Ref. Fig. 009)

One positive and negative output switch combination

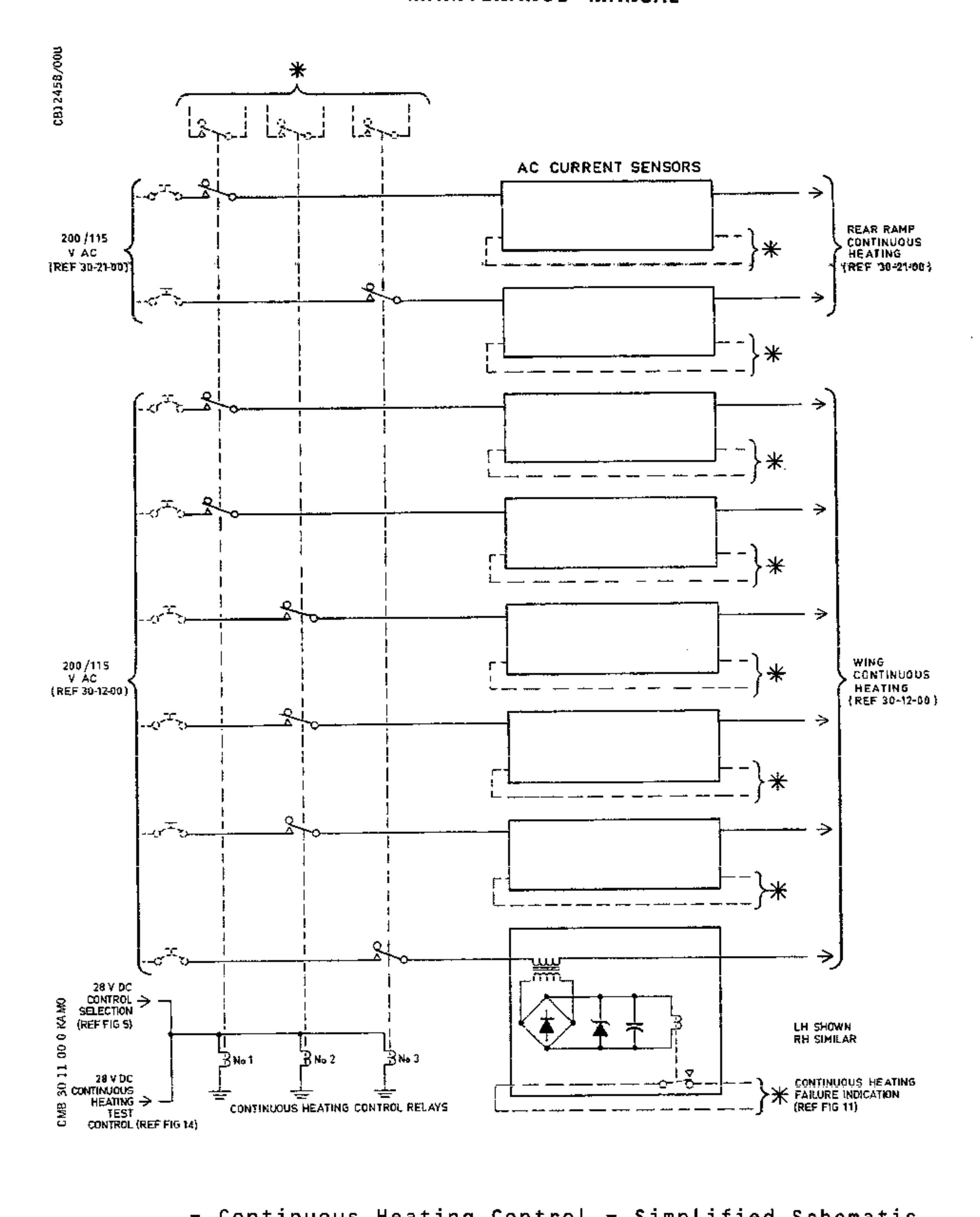
CTPU
NEGATIVE OUTPUT SWITCH
WARNING INHIBITION RELAY
SEQUENCING CIRCUIT (REF FIG 6)
POSITIVE OUTPUT SWITCH
28 V DC (REF FIG 6)
INHIBITION ON NO-CURRENT FAILURE CIRCUIT
LH SHOWN
RH SIMILAR
CMB3011000JAM0

No-load Warning Inhibition -
Simplified Schematic
Figure 009

is not connected to a contactor, therefore when it is selected, no load is applied. This would normally cause failure indication as for a no-current condition. To prevent these spurious indications the appropriate output switches are connected instead to a warning inhibition relay, which places a 28 V d.c. inhibit on the no-current protection circuits in the CTPU whenever the appropriate combination of switches is selected.

(6) Continuous Heating Control (Ref. Fig. 010)

R When the system is activated, a control selection
R supply energizes the wing and rear ramp continuous
R heating control relays. The same supply is used
R to energize the 'D' box continuous heating control
R relays, but these are additionally controlled by
R microswitches and are described later. As soon as
R the control relays are energized, a.c. supplies are
connected via a.c. current sensors to the
continuous heating elements. These elements are



- Continuous Heating Control - Simplified Schematic
Figure 010

R

then heated until the system is de-activated or switched off.

The control relays are also energized, for a limited period only, when a continuous heating test selection is made at the TEST selector switch.

(7) Continuous Heating Failure Indication (Ref. Fig. 011)

When either the system is switched on or a continuous heating test selection is made, a supply is applied to -

(a) the indication circuit of the 'D' box continuous heating, which is described later, and

(b) normally closed contacts of the a.c. current sensors.

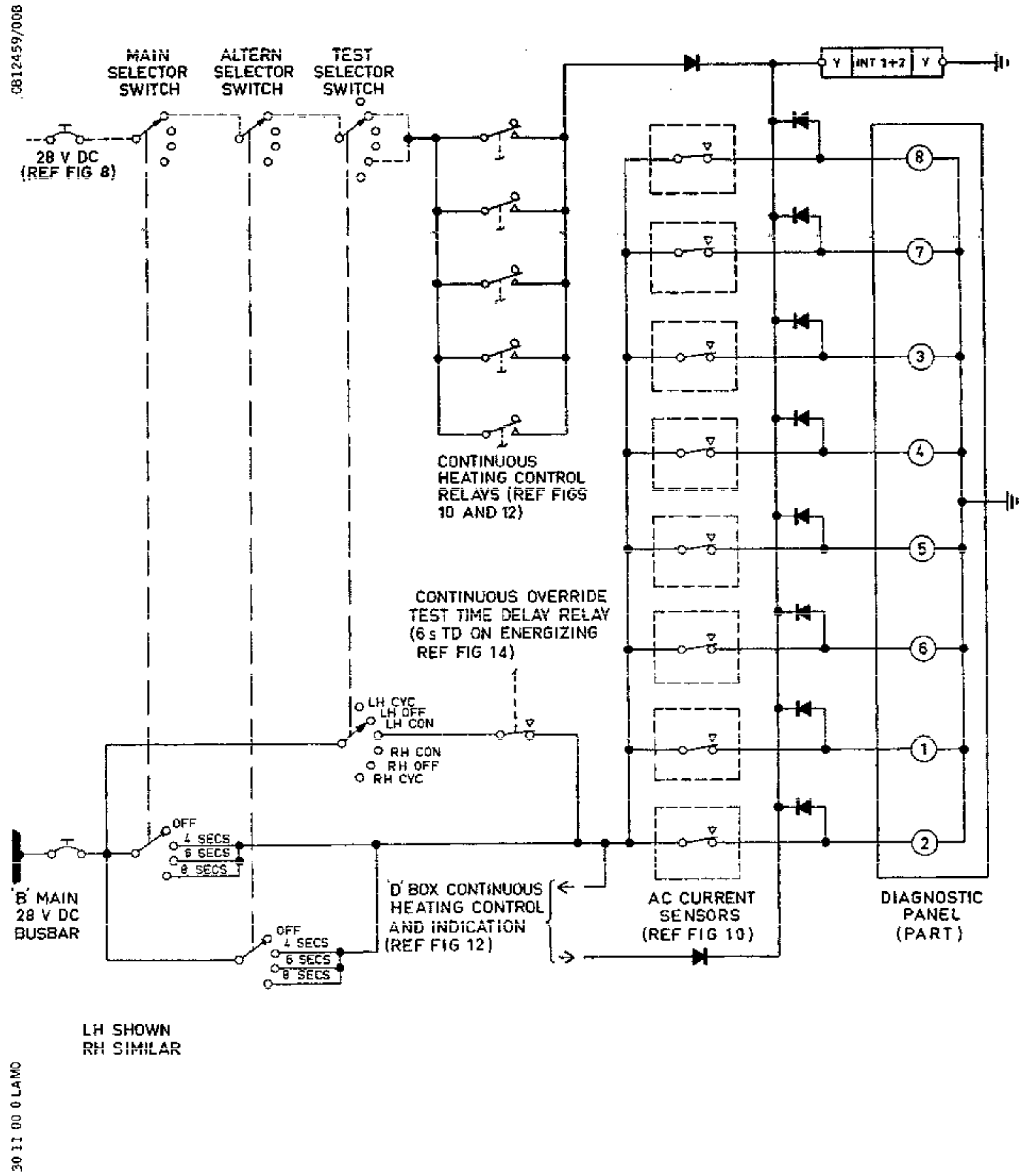
The contacts in each a.c. current sensor will be open and remain open with the load correctly applied, and the failure warnings will be inhibited. However in the event of abnormal current conditions, caused by an open-circuited load or a tripped circuit breaker, the contacts will be closed and the appropriate numbered caption, together with the associated INT 1+2 or INT 3+4 caption, will be illuminated.

To simulate abnormal current conditions power is removed from the continuous heating loads 3 s after selection of a continuous heating test, causing all the failure warnings to be illuminated. After a further 3 s the continuous override test time delay relay is energized (6 s elapsed time) and all the failure warnings are extinguished.

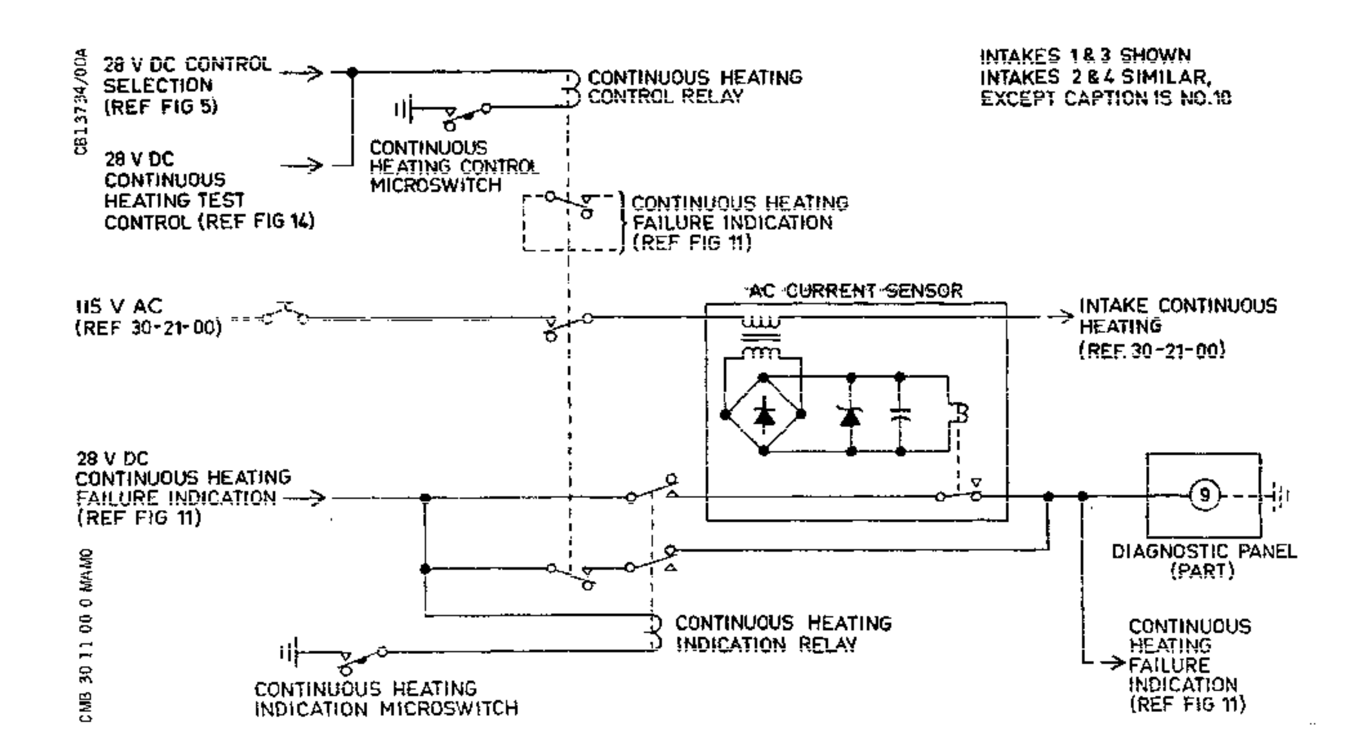
If a continuous heating control relay fails to de-energize when the system is switched off the fault is indicated by illumination of an INT 1+2 or INT 3+4 caption.

(8) 'D' Box Continuous Heating Control and Indication (Ref. Fig. 012).

When the system is activated, the continuous heating control relay is armed by a control selection supply. The relay is not energized, however, unless the associated continuous heating control microswitch



- Continuous Heating Failure Indication -
Simplified Schematic
Figure 011



- 'D' Box Continuous Heating Control and Indication -
Simplified Schematic
Figure 012

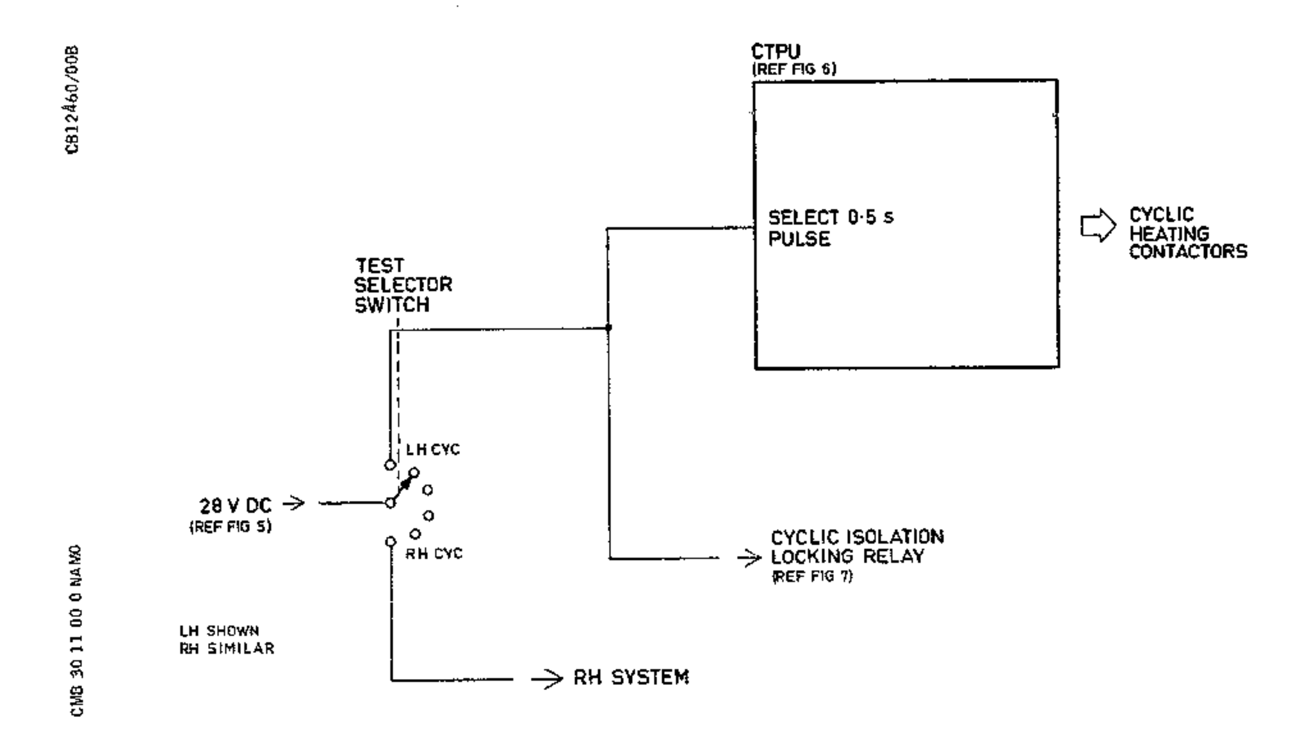
R is closed, and this is only when engine air demands open the auxiliary inlet vane more than 7.5 deg. With the relay energized, a heating power supply is connected to the heating element via an a.c. current sensor.

As with the previously described continuous heating, load failures are sensed by an a.c. current sensor and indicated by illuminated captions. Such indications will of necessity be required only when the heating is operative. For this reason, the load failure indications are inhibited as long as the auxiliary inlet vane remains closed. This is effected by a continuous heating indication relay, which is only energized when the control relay is energized.

Should a control or indication relay fail to energize or de-energize, heat could be incorrectly applied or load failures incorrectly indicated. Therefore extra relay contacts are provided to illuminate the failure captions if either relay is

incorrectly positioned. The circuit will in fact illuminate the captions whenever the relay positions disagree.

(9) Cyclic Heating Test Control (Ref. Fig. 013)



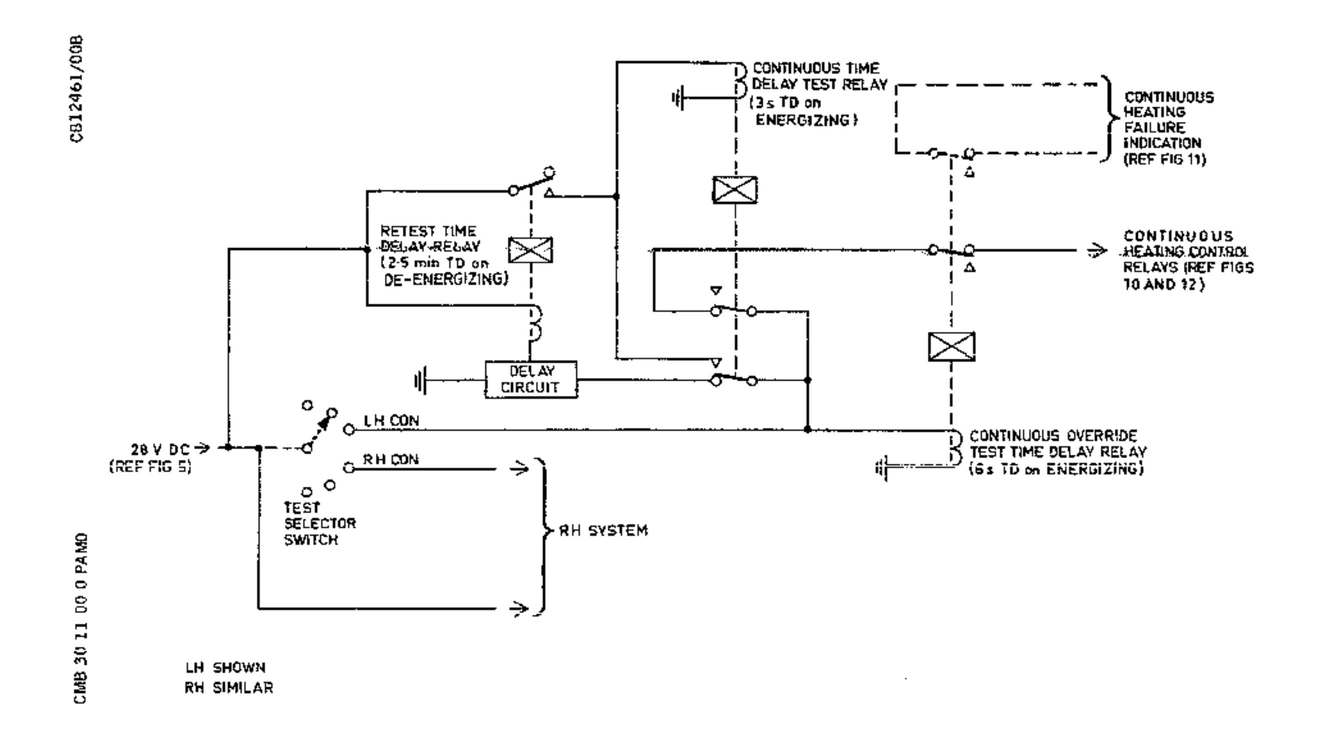
- Cyclic Heating Test Control -
Simplified Schematic
Figure 013

When a cyclic heating test selection is made power is supplied -

(a) to the appropriate CTPU to initiate one complete cycle of the cyclic heating with a pulse duration of 0.5 s (in this condition pulses are applied via the normal control circuits to all cyclic loads and indicating circuits) and

(b) to the cyclic isolation locking relay, to hold the relay with the contacts in the 'reset' position for the duration of the test.

(10) Continuous Heating Test Control (Ref. Fig. 014)



Continuous Heating Test Control -
Simplified Schematic
Figure 014

To include the 'D' box continuous heating in the continuous heating test, it is necessary to open the associated auxiliary inlet vanes manually beyond
R the 7.5 deg open position, and then support them. In the following description it is assumed that such action has been taken.

When a continuous heating test selection is made power is applied -

(a) to the continuous heating control relays, via normally-closed contacts of a continuous time delay test relay and a continuous override test time delay relay, and the continuous heating loads are applied,

(b) to the time delay circuit of a retest time delay relay via normally-closed contacts

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of the continuous time delay test relay (the retest time delay relay is energized immediately (delay on de-energization 2.5 min), and its contacts apply power to the continuous time delay test relay, which is energized after a delay of 3 s) and

(c) to the continuous override test time delay relay, which has a delay of 6 s on energizing.

In this condition, the continuous heating loads are applied for a nominal period of 3 s only, failures being detected and indicated as for a normal failure.

At the end of the 3 s period the continuous time delay test relay is energized. Contacts of this relay -

(a) complete a hold-on circuit which latches the relay via the test switch,

(b) de-energize the continuous heating control relays, thereby terminating the continuous heating, which in turn causes all the failure warnings to be illuminated, and

(c) remove the supply from the delay circuit of the retest time delay relay; this relay remains energized for a further 2.5 min.

Six seconds after the initial test selection, the continuous override test time delay relay is energized. Contacts of this relay -

(a) interrupt the supply to the continuous heating control relays for a second time, thus ensuring that if the continuous time delay test relay fails to energize, power is removed from the continuous heating elements after a nominal period of 6 s, and

(b) interrupt the supply to the continuous heating failure indication circuits, and all failure warning captions are extinguished.

Two and a half minutes after the initial test selection the retest time delay relay is de-energized, and one supply to the continuous time delay test relay is removed. Provided

the test selection has been cancelled the continuous time delay test relay is then de-energized, thus enabling a subsequent test selection to be made.

In order to test the complete 'D' box continuous heating installation, it is necessary to conduct a second continuous heating test with the auxiliary inlet vanes closed. Providing the microswitches and relays take up their correct positions, the associated captions will remain extinguished for the duration of the test.

C. Electrical Power Supplies

Electrical power is supplied from the busbars listed in Table 5.

SERVICE	BUSBAR	CIRCUIT BREAKER PANEL
Main control line	'A' main 28 V d.c.	15-215
Alternative control line	'B' main 28 V d.c.	15-216
Left continuous indication	'B' main 28 V d.c.	15-216
Right continuous indication	'A' main 28 V d.c.	15-215
Left cyclic control	'B' essential 28 V d.c.	3-213
Right cyclic control	'B' main 28 V d.c.	15-216
Left cyclic indication	'B' main 28 V d.c.	15-216
Right cyclic indication	'A' main 28 V d.c.	15-215

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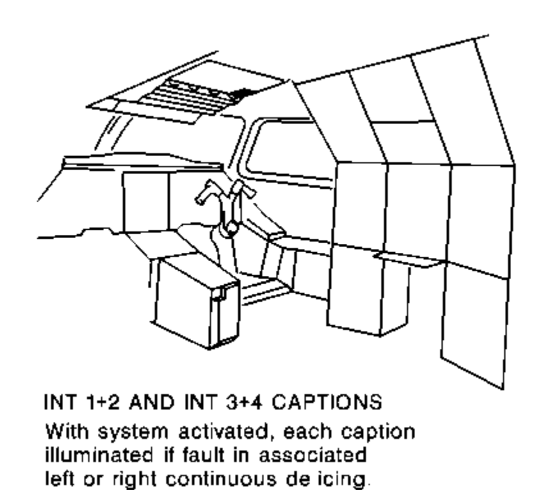
SERVICE	BUSBAR	CIRCUIT BREAKER PANEL
Left wing and intake 1 continuous heaters	No.1 main 115 V a.c.	14-215
Intake 2 continuous heaters	No.2 main 115 V a.c.	13-215
Intake 3 continuous heaters	No.3 main 115 V a.c.	13-216
Right wing and intake 4 continuous heaters	No.4 main 115 V a.c.	14-216
Left wing and intakes, cyclic heaters	No.2 main 200/115 V a.c.	21-215
Right wing and intakes, cyclic heaters	No.3 main 200/115 V a.c.	21-216

Electrical Power Supplies
Table 5

27. System Management (Ref. Fig. 015, 016 and 017)

Certain leading edges in and around the engine intakes, and the wing leading edges forward of the engine intakes, can be heated to protect the engines from the ingestion of large particles of ice. The operating switches and associated captions and indicators are located on the flight compartment roof panel and the left leg of the third crew member's station.

The heated areas must be clear of all protective covers etc., before the system is operated or tested. Electrical ground power is required for the heating itself.



CYCLIC CAPTION

With system activated, caption illuminated steadily if serious fault causes cyclic isolation. Illuminated intermittently for less serious faults.

Press and release to reinstate system after cyclic isolation. Before such action, system must be switched off then on, and counters Ref. Fig. 17) observed to be counting.

INT 1+2 AND INT 3+4 CAPTIONS

With system activated, each caption illuminated if fault in associated left or right continuous de icing.

MAIN SELECTOR SWITCH

This switch and ALTERN selector switch similar, but used on alternate flights.

Set to 4 SECS ON to switch on cyclic de-icing, with 4 s pulse length, and continuous de icing. System not activated unless aircraft airborne and total temperature below+15 deg. C.

Remaining switch positions not used.

TEMP O/RIDE PUSH-SWITCH

Operative only when ALTERN selector switch set to 'on' position.

Press and release to override total temperature switching faults. Circuit self-latched until ALTERN selector switch returned to OFF.

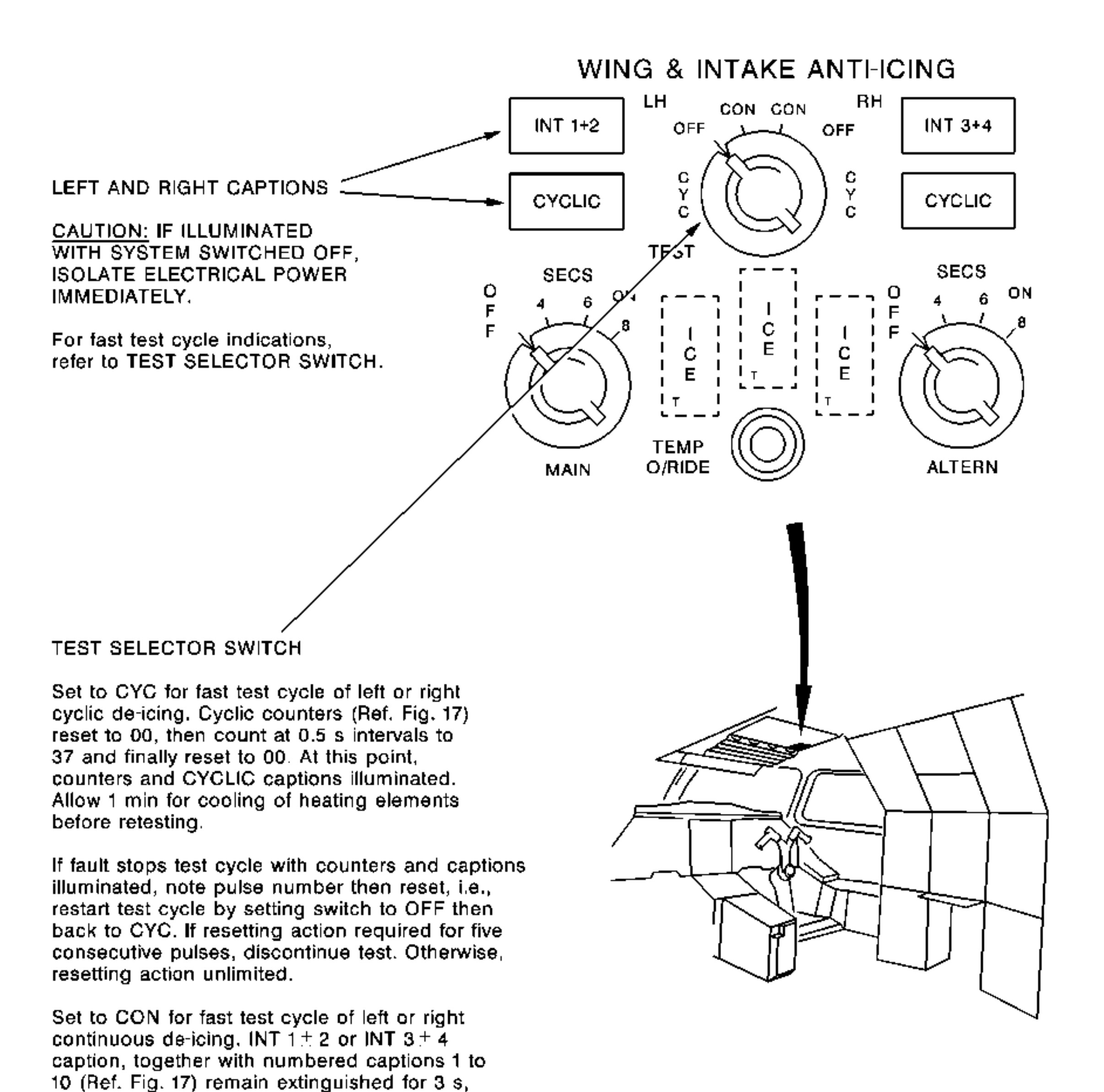
ALTERN SELECTOR SWITCH

Refer to MAIN selector switch for operation.

If MAIN and ALTERN selector switches are in OFF position when ice detectors activated, adjacent red ICE caption and master warning red ICE caption illuminated, and audible warning gong activated. Set either switch and all four ENGINE ANTI-ICING control switches (Ref. Chap. 75) to 'on' position to cancel warnings.
NOTE: For LH detection it is only necessary to switch MAIN or ALTERN selector switch to 'ON' to cancel master warning.

CMB 30 11 00 0 BEMO 00

R System Management - Control and Indication
Figure 015



Set to CYC for fast test cycle of left or right cyclic de-icing. Cyclic counters (Ref. Fig. 17) reset to 00, then count at 0.5 s intervals to 37 and finally reset to 00. At this point, counters and CYCLIC captions illuminated. Allow 1 min for cooling of heating elements before retesting.

If fault stops test cycle with counters and captions illuminated, note pulse number then reset, i.e., restart test cycle by setting switch to OFF then back to CYC. If resetting action required for five consecutive pulses, discontinue test. Otherwise, resetting action unlimited.

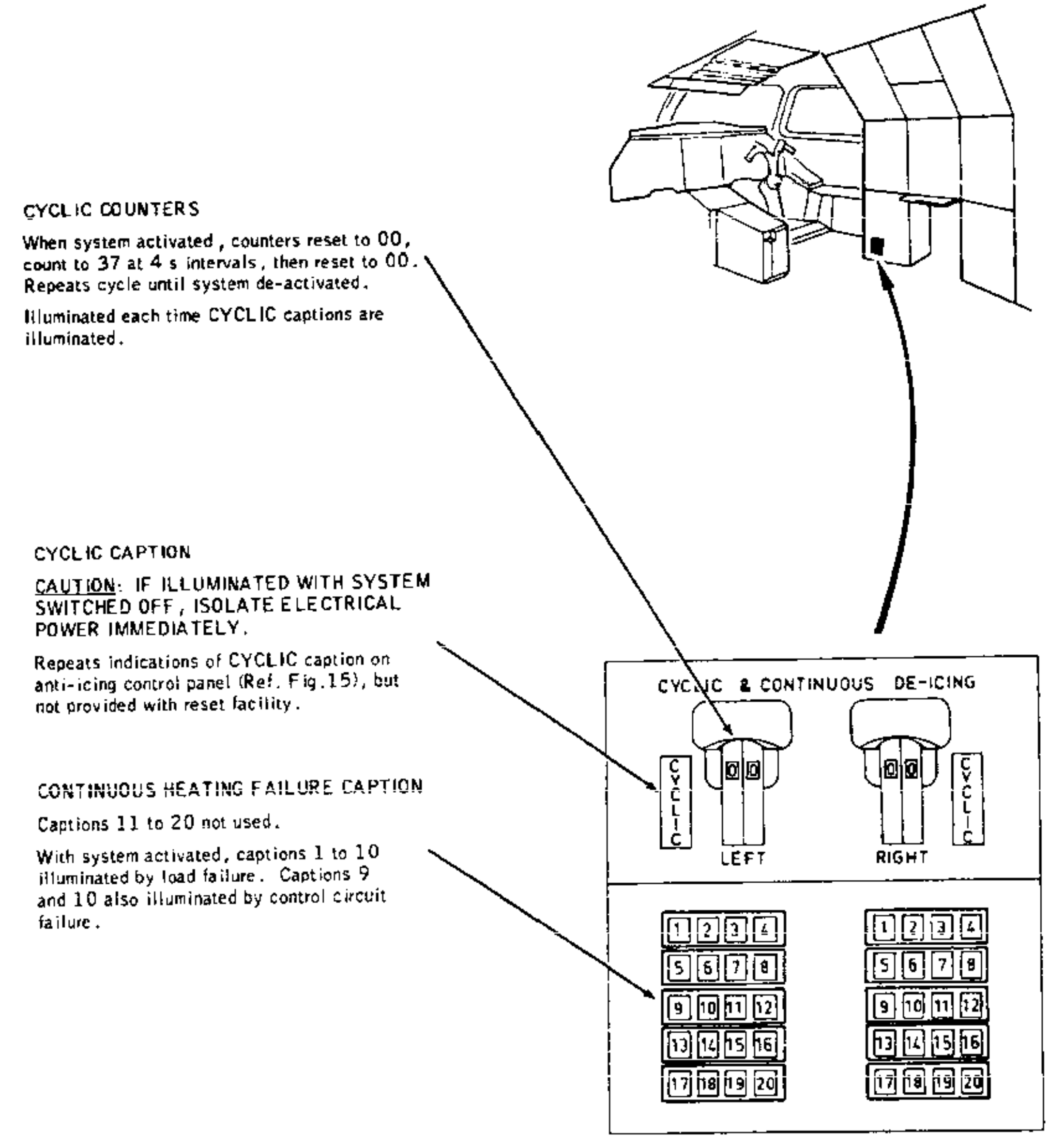
Set to CON for fast test cycle of left or right continuous de-icing. INT 1 + 2 or INT 3 + 4 caption, together with numbered captions 1 to 10 (Ref. Fig. 17) remain extinguished for 3 s, and are then illuminated for 3 s. Retest not possible for 2 min 30 s, due to automatic delay.

Numbered captions 9 and 10 excluded from test if auxiliary inlet vanes not open more than 7.5 deg.

CMB 30 11 00 0 BGM0 00

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System Management - Fast Test Cycles
Figure 016



- System Management - Diagnostic Panel
R Figure 017

DE-ICING CONTROL AND INDICATION - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

CAUTION: IF AN "INT 1&2", "INT 3&4" OR "CYCLIC" CAPTION IS ILLUMINATED WITH THE SYSTEM SWITCHED OFF, ISOLATE THE ASSOCIATED HEATING POWER SUPPLIES IMMEDIATELY (REF. ADJUSTMENT/TEST).

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. paras.3. to 7 incl.), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification tables (Ref. Tables 101 to 105). The tables provide information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Tables 101 to 105).

The trouble shooting procedures are divided into five paragraphs, each of which is supplied with, and must be preceded by, its own preparation procedure.

Trouble shooting paragraphs 3. and 4. are based on the Operational Test, therefore the procedures deal mainly with those faults that occur during test cycles of the built-in test equipment. The procedures in paragraphs 5. and 6. deal with faults in the common control lines, and it is assumed that cyclic de-icing test cycles have already been carried out. The dormant circuits of the system are dealt with in paragraph 7., and again it is assumed that a cyclic de-icing test cycle

has been carried out. In order to make the dormant circuits active, the loads are isolated and faults are simulated.

A test set supplied with three test cables is used to pinpoint defects, mainly in the cyclic de-icing, and is connected into the system at the appropriate left or right cylic timer and protection unit (CTPU) in the underfloor baggage compartment. When test cable 1 is connected between the test set and a test socket on the CTPU, the system can, apart from a few
R operations at the system control panel 4-211, be controlled from the test set, and pulse durations of 0.5 s (test cycle) or 4 s (in-flight cycle) can be used. With the 4 s pulse duration selected, switches on the test set are used to isolate the loads from the power supplies and inhibit the resulting no-current failure condition. Test cable 2 and the test set replace the output matrix wiring and contactor coils so that the output pulses from the CTPU can be individually checked on the test set. Test cable 3 connects the matrix wiring, contactor coils, etc., to the test set, also so that they may be individually checked. CTPU power supplies are used throughout.

The lists of components have been broken down into five separate Tables. Table 101 consists of a list of numbered components which are general to the system. To provide a useful reference, Tables 102 to 105, inclusive, consist of lists of left and right cyclic and continuous de-icing pulses and loads.

Three further Tables are provided: Table 106 is a chart reference for single or multiple failures occurring on pulses of a cyclic de-icing test cycle; Tables 107 and 108 list the correct resistance, including tolerance, of each cyclic and continuous de-icing load respectively.

Where circuits are similar for LH and RH sub-systems, a single trouble shooting procedure is provided, and the references to the components listed in the associated Table are given, e.g., Renew Relay (38) or (47) or, in the case of specific heating loads, 'renew the associated contactor'. These references, and others applicable to associated components, are presented in the sequence LH, RH.

2. Preparation

CAUTION: ENSURE THAT ALL APPLICABLE DE-ICED AREAS ARE FREE
R FROM PROTECTIVE COVERS AND EQUIPMENT FOR THE
R DURATION OF THE TROUBLE SHOOTING.

A. Equipment and Materials

DESCRIPTION	PART NO.
R De-icing fault diagnostic test set	TE 6063000
Testmeter, Avometer type 8	-
Insulation resistance meter (battery controlled)	Evershed and Vignoles or equivalent
Resistance meter (bridge type)	Croydon Precision Instruments type PW2 or equivalent
Stop watch	-
Circuit breaker safety clips	-

R NOTE: With regard to the test set controls, the term 'down' means the TEST CYC, RUN, NORMAL, unmarked or fully counter-clockwise position. When required, test cables should be connected as follows -

Cable 1 - between test set connector 1 and CTPU fixed connector 1H1839-D (2H1839-D).

Cable 2 - between test set connector 2 and CTPU fixed connector 1H1839-B (2H1839-B).

R Cable 3 - between test set connector 3 and free connector 1H1839-B (2H1839-B).

B. Cyclic De-icing

(1) Make available electrical ground power as detailed in 24-41-00.

R
R (2) On panel 4-211, set the MAIN selector switch to "4 SECS-ON" and ensure that the ALTERN and TEST selector switches are at an 'off' position.

C. Continuous De-icing

CAUTION: WHEN SUPPORTING THE AUXILIARY INLET VANES IN THE OPEN POSITION, TAKE CARE NOT TO DAMAGE THE VANE

STRUCTURE OR THE 'D' BOX DE-ICING MATS.

(1) Observing the safety precautions detailed in 71-62-00, Servicing, open more than 8 deg the auxiliary inlet vanes of the left (right) engine intakes, and securely support them in this position.

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Ensure that the system MAIN, ALTERN and TEST selector switches are at an 'off' position.

D. Main Control Selection

CAUTION: FAILURE TO CARRY OUT THE FOLLOWING TWO OPERATIONS WILL CAUSE OVERHEATING AND SUBSEQUENT DAMAGE TO A LARGE NUMBER OF HEATING ELEMENTS.

(1) Disconnect and pull back connectors 1H1839-B and 2H1839-B from the left and right CTPUs (34) and (43).

(2) Trip and fit safety clips to all the circuit breakers listed in Tables 104 and 105 (one for each continuous de-icing load).

(3) Ensure that all services liable to be adversely affected by the tripping of the left weight switch circuit breaker are effectively isolated
R (Ref. 7-11-00), except for the wing and intake
R de-icing system.

(4) Trip and fit a safety clip to the LH UC WEIGHT SW A SYS SUP circuit breaker G292, panel 1-213, map ref.M17.

R (5) Set the ADC 1 master switch on centre console panel 9-211 to the "ON" position.

R (6) Set the ADC 1 - TEST selector switch on panel 9-211
R to the "1" position.

R (7) Make available electrical ground power as detailed in 24-41-00.

E. Alternative Control Selection

CAUTION: FAILURE TO CARRY OUT THE FOLLOWING TWO OPERATIONS WILL CAUSE OVERHEATING AND SUBSEQUENT DAMAGE TO A LARGE NUMBER OF HEATING ELEMENTS.

(1) Disconnect and pull back connectors 1H1839-B and 2H1839-B from the left and right CTPUs (34) and (43).

(2) Trip and fit safety clips to all the circuit breakers listed in Tables 104 and 105 (one for each continuous de-icing load).

(3) Ensure that all services liable to be adversely affected by the tripping of the right weight switch circuit breaker are effectively isolated (Ref. 7-11-00), except for the wing and intake de-icing system.

(4) Trip and fit a safety clip to the RH UC WEIGHT SW B SYS SUP circuit breaker G294, panel 3-213, map ref.B9.

(5) Set the ADC 2 master switch on panel 9-211 to the "ON" position.

(6) Set the ADC 2-TEST selector switch on panel 9-211 to the "1" position.

(7) Make available electrical ground power as detailed in 24-41-00.

F. Dormant Faults

CAUTION: FAILURE TO CARRY OUT THE FOLLOWING TWO OPERATIONS WILL CAUSE OVERHEATING AND SUBSEQUENT DAMAGE TO A LARGE NUMBER OF HEATING ELEMENTS.

(1) Trip and fit safety clips to the following continuous heating circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
INT 2 AUX DOOR D BOX HTR SUP	13-215	2H1411	A 9
INT 2 REAR RAMP HTR SUP	13-215	2H1415	A10
INT 1 REAR RAMP HTR SUP	14-215	1H1415	B 6
INT 1 AUX DOOR D BOX HTR SUP	14-215	1H1411	B 7
LH WING SECT 13.7 & 15.3 HTRS CONTN SUP	14-215	1H372	C 6

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
LH WING SECT 14.1 & 14.2 HTRS CONTN SUP	14-215	1H373	C 7
LH WING FAIRING & SECT 13.1 HTRS CONTN SUP	14-215	1H403	C 8
LH WING SECT 13.5 & 13.6 HTRS CONTN SUP	14-215	1H371	D 6
LH WING SECT 15.1 & 15.2 HTRS CONTN SUP	14-215	1H374	D 7
LH WING SECT 13.2, 13.3 & 13.4 HTRS CONTN SUP	14-215	1H406	D 8
INT 4 REAR RAMP HTR SUP	14-216	4H1415	A14
INT 4 AUX DOOR D BOX HTR SUP	14-216	4H1411	A15
RH WING SECT 13.7 & 15.3 HTRS CONTN SUP	14-216	2H372	B12
RH WING SECT 14.1 & 14.2 HTRS CONTN SUP	14-216	2H373	B13
RH WING FAIRING & SECT 13.1 HTRS CONTN SUP	14-216	2H403	B15
RH WING SECT 13.5 & 13.6 HTRS CONTN SUP	14-216	2H371	C12
RH WING SECT 15.1 & 15.2 HTRS CONTN SUP	14-216	2H374	C13
LH WING CONTN IND	15-216	H1511	B15
RH WING CONTN IND	15-215	H1512	B11
RH WING SECT 13.2, 3 & 4	14-216	2H406	C11
INT 3 AUX DOOR D BOX			

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
HTR SUP	13-216	3H1411	A10
INT 3 REAR RAMP HTR SUP	13-216	3H1415	A11

(2) In the underfloor baggage compartment, gain access to the left and right cyclic timer and protection units (CTPU's), then isolate the cyclic heating contactors by disconnecting and pulling back connectors 1H1839-B and 2H1839-B.

(3) Ensure that all the de-icing fault diagnostic test set controls are in the 'down' position (ref. para. 2A), and connect the test set to the appropriate CTPU with test cables 1 and 2.

(4) Ensure that all services liable to be adversely affected by the tripping of the left weight switch circuit breaker are effectively isolated (Ref. 7-11-00), except for wing and intake de-icing.

(5) Trip and fit a safety clip to the following circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
LH UC WEIGHT SW A SYS SUP	1-213	G292	M17

(6) On panel 9-211, set the ADC 1 master and ADC 1-TEST selector switches to the "ON" and "1" positions respectively.

(7) On panel 4-211, ensure that the system MAIN, ALTERN and TEST selector switches are at an 'off' position.

(8) Make available electrical ground power as detailed in 24-41-00.

3. Trouble Shooting - Cyclic De-icing

R NOTE: For identification of numbered components, refer to Table 101, and for unnumbered components and P/N switch
R combinations, refer to Tables 102 and 103.

```
A.*****************************************
  *Prepare to trouble shoot (Ref. para.2.).*
  *Check that the "CYCLIC" captions are not*
  *illuminated.  If -                      *
  ******************************************
              |    |
              |    |         ----------------------------------
              |    |        |CYCLIC caption or captions        |
              OK   NOT OK---|illuminated with system switched  |
              |             |off - remove Relay (38) or (47)   |
              |             |and check for 28 V d.c. at pin 8  |
              |             |of the relay socket. If NO, renew |
              |             |Contactor (37) or (46). If YES,   |
              |             |renew CTPU (34) or (43).          |
              |              ----------------------------------
              |
B.*****************************************
  *On panel 4-211, commence a test cycle by*
  *setting the TEST selector switch to "LH *
  *CYC" (RH CYC). Monitor the test cycle   *
  *with a stop-watch and check that the    *
  *cyclic counters are first reset to 00,  *
  *then count to 37 at approximate 0.5 s   *
R *intervals. Check also that at an elapsed*
R *time of between 17 and 21 s, the        *
  *counters are reset to 00, with the      *
  *counters and associated CYCLIC captions *
  *illuminated. Repeat the test several    *
  *times, with an interval of 1 min between*
  *tests, if an intermittent fault is      *
  *suspected.                              *
  *NOTE: If during a test cycle, the cyclic*
  *      counters stop counting, with the  *
  *      counters and associated CYCLIC    *
  *      captions illuminated, note the    *
  *      pulse number displayed.  The test *
  *      can then be resumed by first      *
  *      setting the TEST switch to an     *
  *      'off' position and then returning *
  *      it to the appropriate test cycle  *
  *      position. If such resetting action*
```

```
*      is required for the first five    *
*      consecutive pulses, the test cycle*
*      must be terminated. Otherwise,    *
*      resetting action may be carried   *
*      out any number of times to        *
*      complete a test cycle, provided   *
*      the pulse numbers are noted. IF - *
*****************************************
                    |
                    |
                    |
                 NOT OK-------
```

1. CYCLIC captions illuminated and counters not reset to 00 at start of test cycle - Chart 101
2. Fault on warning inhibition pulse, i.e., pulse 12 - renew associated warning inhibition
R relay. If fault does not clear,
R renew CTPU (34) or (43).
3. CYCLIC captions are illuminated every alternate pulse - Chart 102.
4. Counters stop counting and CYCLIC captions illuminated one or more times before test cycle is complete - For Chart, refer to Table 106.
R 5. CYCLIC captions extinguished for correct test cycle period, but counters either stop counting before test cycle is complete, or do not reset to 00 at end of test cycle - connect test set to CTPU (34) or (43) with test cable 1, ensuring that all the test set controls are in the 'down' position, and repeat the test. Are the counters on the test set operating correctly? If YES, renew panel (30). If NO, renew CTPU (34) or (43).
R 6. Counters reset to 00 before 37 is reached - are CYCLIC captions illuminated after correct cycle time? If YES, renew panel (30). If NO, renew CTPU (34) or (43).
R 7. CYCLIC captions not illuminated at end of test cycle - Chart 109.
R 8. CYCLIC caption(s) illuminated

```
R                                            |   intermittently, i.e., only on  |
R                                            |   some test cycles - Chart 110.  |
R                                            |9. Test cycle completed outside   |
R                                            |   elapsed time limits - renew    |
R                                            |   CTPU (34) or (43).             |
R                                            |10.Test cycle suspect, but not in|
R                                            |   any of the ways so far         |
R                                            |   described - renew CTPU (34) or |
R                                            |   (43).                          |
R                                             ----------------------------------
```

4. Trouble Shooting - Continuous De-icing

WARNING: WHEN WORKING ON OR NEAR THE ENGINE INTAKES, OBSERVE THE SAFETY PRECAUTIONS DETAILED IN 71-62-00, SERVICING.

NOTE: For identification of numbered components refer to Table 101, and for unnumbered components, refer to Tables 104 and 105.

```
A.*****************************************
  *Prepare to trouble shoot (Ref. para.2.).*
  *Check that the "INT 1&2" and "INT 3&4"  *
  *captions are not illuminated. IF -      *
  *****************************************
             |    |
             |    |               ----------------------------------
             |    |              |"INT 1&2" or "INT 3&4" caption     |
             OK   NOT OK---------|illuminated with system switched   |
             |                   |off - Chart 111.                   |
             |                    ----------------------------------
             |
B.*****************************************
  *On panel 4-211, commence a test cycle by*
  *setting the TEST selector switch to the *
  *"LH CON" (RH CON) position. Monitor the *
  *test cycle with a stop-watch and check  *
  *that the appropriate INT 1&2 or INT 3&4 *
  *caption, together with the associated   *
  *captions numbered 1 to 10 inclusive,    *
  *remain extinguished for the first 3 s   *
  *after selection, and are then illumi-   *
  *nated for a period of 3 s only.  IF -   *
  *****************************************
             |    |
```

```
       |     |
       |     |       ------------------------------------
       |     |      |1. No captions illuminated during   |
      OK    NOT OK--|   second 3 s test period -         |
                    |   Chart 112.                       |
       |            |2. One of the first eight numbered  |
       |            |   captions and an INT 1&2 or INT   |
       |            |   3&4 caption illuminated for the  |
       |            |   first 3 s test period -          |
       |            |   Chart 113.                       |
       |            |3. Numbered caption '9' or '10'     |
       |            |   and an INT 1&2 or INT 3&4        |
       |            |   caption illuminated for the      |
       |            |   first 3 s test period - Chart    |
       |            |   114.                             |
       |            |4. All captions illuminated longer  |
       |            |   than 3 s - renew Relay (22) or   |
       |            |   (25).                            |
       |            |5. Individual numbered caption      |
       |            |   not illuminated during second    |
       |            |   3 s test period - Chart 115.     |
       |            |6. Numbered captions '1', '5' and   |
       |            |   '6' and an INT 1&2 or INT 3&4    |
       |            |   caption illuminated for the      |
       |            |   first 3 s test period - renew    |
       |            |   common control relay.            |
       |            |7. Numbered captions '2' and '7'    |
       |            |   and an INT 1&2 or INT 3&4        |
       |            |   caption illuminated for the      |
       |            |   first 3 s test period - renew    |
       |            |   common control relay.            |
       |            |8. Numbered captions '3', '4' and   |
       |            |   '8' and an INT 1&2 or INT 3&4    |
       |            |   caption illuminated for the      |
       |            |   first 3 s test period - renew    |
       |            |   common control relay.            |
       |             ------------------------------------
C.*****************************************
  *Attempt to perform a second test cycle *
  *before 2 min 30 s have passed. Check   *
  *that the system remains inert. IF -    *
  *****************************************
       |     |
       |     |       ------------------------------------
       |     |      |Second test cycle accomplished      |
      OK    NOT OK--|before 2 min 30 s safety period     |
R      |            |has passed - renew relay (20) or    |
       |            |(23).                               |
       |             ------------------------------------
```

```
D.****************************************
  *Remove the supports and allow the LH    *
  *(RH) auxiliary inlet vanes to close.    *
  *When the 2 min 30 s required for de-    *
  *energization of the retest relay have   *
  *passed, repeat the test detailed in     *
  *para.B., but check this time that       *
  *numbered captions 9 and 10 remain ex-   *
  *tinguished throughout the test.         *
  ****************************************
                 |
                 |
                 |
              NOT OK------|1. Numbered caption '9' or '10'
                          |   illuminated for the first 3 s
                          |   test period - check the
                          |   operation and setting of the
                          |   associated control microswitch
                          |   (Ref. 71-64-12, Adjustment/
                          |   Test). Readjust or renew as
                          |   necessary.
                          |2. Numbered caption '9' or '10'
                          |   illuminated for the full 6 s
                          |   - check the operation and
                          |   setting of the associated
                          |   indication microswitch (Ref.
                          |   71-64-12, Adjustment/Test).
                          |   Readjust or renew as necessary.
```

5. Trouble Shooting - Main Control Selection

NOTE: For identification of numbered components refer to Table 101.

```
   A.*****************************************
     *Prepare to trouble shoot (Ref. para.2.).*
     *On panel 4-211, set the MAIN selector   *
     *switch to the "4 SECS - ON" position.   *
R    *Monitor the system with a stop-watch and*
R    *check that the left and right cyclic    *
R    *systems operate as for a no-current     *
R    *failure condition with pulses of 4 s    *
R    *duration, i.e., the cyclic counters are *
R    *first reset to 00, then count to 37 at  *
R    *approximate 4 s intervals and then reset*
R    *to 00 in an elapsed time of between     *
R    *2 min 17 s and 2 min 47 s; the counters *
R    *and associated CYCLIC captions will be  *
R    *illuminated for the duration of each    *
R    *pulse. Disregard the continuous heating *
R    *captions. IF -                          *
R    *NOTE: The system will continue to cycle *
R    *      for as long as the MAIN selector  *
R    *      switch remains at "4 SECS - ON".  *
R    ******************************************
R                    |
R                    |           -----------------------------------
R                    |          |1. System inoperative with main    |
R                  NOT OK-----  |   control line selected - Chart   |
R                               |   116.                            |
R                               |2. System operating, but outside   |
R                               |   elapsed time limits on one      |
R                               |   cyclic system - Chart 117.      |
R                               |3. One cyclic counter not          |
R                               |   resetting to 00 at start of     |
R                               |   normal heating cycle - Chart    |
R                               |   118.                            |
R                                -----------------------------------
```

6. Trouble Shooting - Alternative Control Selection

NOTE: For identification of numbered components refer to Table 101.

```
   A.*******************************************
     *Prepare to trouble shoot (Ref. para.2.).*
     *On panel 4-211, set the ALTERN selector *
     *switch to the "4 SECS - ON" position.   *
R    *Monitor the system with a stop-watch and*
R    *check that the left and right cyclic    *
R    *systems operate as for a no-current     *
R    *failure condition with pulses of 4 s    *
R    *duration, i.e., the cyclic counters are *
R    *first reset to 00, then count to 37 at  *
R    *approximate 4 s intervals then reset to *
R    *00 in an elapsed time of between        *
R    *2 min 17 s and 2 min 47 s; the counters *
R    *and associated CYCLIC captions will be  *
R    *illuminated for the duration of each    *
R    *pulse. Disregard the continuous heating *
R    *captions. IF-                           *
R    *NOTE: The system will continue to cycle *
R    *      for as long as the ALTERN selector*
R    *      switch is at "4 SECS - ON".       *
R    ******************************************
R              |    |
R              |    |                   ---------------------------------
R              |    |                  |1. System inoperative with altern-|
R              OK   NOT OK-------------|   ative control line selected -  |
R              |                       |   Chart 119.                     |
R              |                       |2. System operating, but outside  |
R              |                       |   elapsed time limits on one     |
R              |                       |   cyclic system - Chart 120.     |
R              |                        ---------------------------------
R              |
   B.*******************************************
     *On panel 9-211, return the ADC 2 master *
     *switch to the "OFF" position. (Note     *
     *that the cyclic sequence is terminated).*
     *Next, press and release the TEMP O/RIDE *
     *switch on panel 4-211 and check that the*
     *cyclic sequence is resumed. IF-         *
     ******************************************
                    |
```

NOT OK --------

Cyclic sequence is not resumed, i.e., temperature override ineffective - remove relay (18). Is 28 V d.c. available at pin X1 of the relay socket when the TEMP O/RIDE switch is pressed? If YES, renew relay (18). If NO, renew switch (17).

R
R
R

7. Trouble Shooting - Dormant Faults

NOTE: For identification of numbered components, refer to Table 101, and for unnumbered components, refer to Tables 104 and 105.

Unless instructed otherwise, disregard the test set FAULT ANNUNCIATORS in the following procedures.

```
A.*****************************************
  *Prepare to trouble shoot (Ref. para. 2).*
  *CYCLIC ISOLATION                        *
  *Set the test set POWER switch to "ON"   *
  *and the centre CURRENT INHIBIT switch to*
  *"INHIBIT". On panel 4-211, select the   *
  *MAIN selector switch to "4 SECS - ON"   *
  *and on the test set, set the centre     *
  *CYCLIC CONTROL switch to "ISOL" for at  *
  *least 2 s and then return it to the     *
  *'down' position. Check that the "CYC    *
  *FAIL" amber annunciator on the test set *
  *and the CYCLIC caption on panel 4-211   *
  *are and remain illuminated. Disregard   *
  *pulse indications. IF-                  *
  *****************************************
              |    |
              |    |                   ----------------------------------
              |    |                  |1. "CYC FAIL" annunciator fails to|
              OK   NOT OK-------------|   illuminate, i.e., isolation by |
              |                       |   the three-phase contactor not  |
              |                       |   confirmed - remove relay (38)  |
              |                       |   or (47). Has the annunciator   |
              |                       |   been illuminated? If YES, refit|
              |                       |   the relay and then renew CTPU  |
              |                       |   (34) or (43). If NO, refit the |
              |                       |   relay and then renew contactor |
              |                       |   (37) or (46).                  |
              |                       |2. "CYC FAIL" annunciator fails to|
              |                       |   remain illuminated, i.e.,      |
              |                       |   faulty latch-out circuit -     |
              |                       |   Chart 121.                     |
              |                        ----------------------------------
              |
B.*****************************************
  *CYCLIC RESET                            *
  *On panel 4-211, press and release the   *
  *illuminated LH(RH) CYCLIC caption and   *
  *check that the caption, and the CYC FAIL*
  *annunciator on the test set, are        *
  *extinguished.                           *
  *On panel 4-211, set the MAIN selector   *
```

```
R    *switch to "OFF".   IF-                     *
R    *****************************************
R                    |    |
R                    |    |          -----------------------------------
R                    |    |         |CYCLIC caption and CYC FAIL        |
R                   OK   NOT OK-----|annunciator remain illuminated,    |
R                    |              |i.e., faulty latch-out reset       |
R                    |              |circuit - remove relay (38) or     |
R                    |              |(47); then hold depressed the      |
R                    |              |CYCLIC caption on panel 4-211 and  |
R                    |              |check for 28 V d.c. at pin 10 of   |
R                    |              |the relay socket. If YES, renew    |
R                    |              |relay (38) or (47). If NO, renew   |
R                    |              |caption (28) or (29).              |
R                    |               -----------------------------------
R                    |
R  C.*****************************************
R    *PROLONGED CURRENT PROTECTION               *
R    *                                           *
R    *WARNING: 200/115 V IS PRESENT AT THE       *
R    *         THREE-PHASE CONTACTOR TERMINALS*
R    *                                           *
R    *Return the test set POWER switch to        *
R    *'down'; then disconnect the electrical     *
R    *connector from contactor (37) or (46).     *
R    *Set the test set POWER switch to "ON"      *
R    *and start the system cycling with a        *
R    *pulse duration of 4 s by setting the       *
R    *MAIN selector switch on panel 4-211 to     *
R    *"4 SECS-ON". The pulse counter will        *
R    *reset to 00 and commence a 4 s pulse       *
R    *cycle. Stop the system cycling on any      *
R    *pulse other than 04, 11, 20, or 37 by      *
R    *setting the CLOCK switch to "STOP"; then*
R    *set the left CURRENT INHIBIT switch to     *
R    *"INHIBIT" and the SIM A, SIM B, SIM C      *
R    *and SIM MASTER switches to "ON".           *
R    *Carefully operate the controls adjacent    *
R    *to meters A, B and C until a simulated     *
R    *load current of 15 A is indicated on       *
R    *each meter. Return the centre CURRENT      *
R    *INHIBIT switch to "NORMAL" and, if the     *
R    *UNBAL amber annunciator is illuminated,    *
R    *press and release the RESET push-switch.*
R    *with 15 A simulated on all three phases,*
R    *set the left CURRENT INHIBIT switch to     *
R    *"NORMAL" and check that between 9.5 and    *
R    *12 s elapsed time, the green and           *
R    *appropriate red sequence annunciators      *
R    *are extinguished (signifying cyclic        *
R    *isolation) and the "CYC FAIL" amber        *
```

```
R    *annunciator is illuminated.              *
R    *When the check is completed, return the *
R    *MAIN switch on 4-211 to "OFF", the CLOCK*
R    *switch to "RUN" and the left CURRENT    *
R    *INHIBIT switch to "INHIBIT", then press *
R    *and release the RESET push-switch. IF-  *
R    ******************************************
R                |    |
R                |    |            ---------------------------------
R                |    |           |After between 9.5 and 12 s of    |
R                OK   NOT OK------|simulated prolonged current      |
R                |                |operation, the "CYC FAIL"        |
R                |                |annunciator is not illuminated and|
R                |                |/or the green and red sequence   |
R                |                |annunciators remain illuminated, |
R                |                |i.e., prolonged current protection|
R                |                |circuit malfunctioning - renew   |
R                |                |CTPU (34) or (43). If fault does |
R                |                |not clear, renew transformer (35)|
R                |                |or (44).                         |
R                |                 ---------------------------------
R                |
R  D.******************************************
R    *UNBALANCED CURRENT PROTECTION            *
R    *Set the MAIN switch on panel 4-211, to  *
R    *"4 SECS-ON"and the system will reset the*
R    *PULSE NO counters to 00 and then cycle  *
R    *with a pulse duration of 4 s.           *
R    *Stop the system cycling on any pulse    *
R    *other than 04, 11, 20 or 37 by setting  *
R    *the CLOCK switch to "STOP".             *
R    *Carefully operate the control adjacent  *
R    *to meter A, B or C to reduce the        *
R    *simulated current in one phase.         *
R    *Check that when the meter is indicating *
R    *between 10.1 and 9.1 A, the "CYC FAIL"  *
R    *amber annunciator is illuminated and the*
R    *green and appropriate red sequence      *
R    *annunciators remain illuminated.        *
R    *When the check is completed, return the *
R    *simulated current in the reduced phase  *
R    *to 15 A and then press and release the  *
R    *RESET push-switch. IF-                  *
R    ******************************************
R                |    |
R                |    |            ---------------------------------
R                |    |           |When the simulated current in one |
R                OK   NOT OK------|phase is reduced to between 10.1 |
R                |                |and 9.1 A, simulating an         |
R                |                |unbalanced current condition, the |
R                |                |"CYC FAIL" annunciator is not    |
```

illuminated and/or the green and red sequence annunciators are extinguished, i.e., unbalanced current protection circuit malfunctioning - renew CTPU (34) or (43). If fault does not clear, renew transformer (35) or (44).

E. *NO-CURRENT PROTECTION*
Set the right CURRENT INHIBIT switch to "INHIBIT". Carefully operate the control adjacent to meter A to reduce the simulated current in phase A.
Check that when the meter is indicating between 5 and 2 A, the "CYC FAIL" amber annunciator illuminates and the green and appropriate red sequence annunciators remain illuminated.
When the check is completed, return the simulated current in phase A to 15 A and then press and release the RESET push-switch. IF-

OK

NOT OK------- When the simulated current in phase A is reduced to between 5 and 2 A, simulating a no-current condition, the "CYC FAIL" annunciator is not illuminated and /or the green and red sequence annunciators are extinguished, i.e., no-current protection circuit malfunctioning - renew CTPU (34) or (43). If fault does not clear, renew transformer (35) or (44). IF-

F. *OVERCURRENT PROTECTION*
Set the rotary FAULT SWITCH to the phase A position and then press and release the OVER push-switch. Check that the green and appropriate red sequence annunciators are extinguished and the "CYC FAIL" amber annunciator is illuminated.
On panel 4-211, set the MAIN switch to

```
R     *"OFF", press and release the RESET push-*
R     *switch and then set the CLOCK switch to *
R     *"RUN". Set the MAIN switch to "4 SECS-  *
R     *ON". The system will then reset the     *
R     *cyclic counters to 00 and cycle with a  *
R     *pulse duration of 4 s. Stop the system  *
R     *cycling on any pulse other than 04, 11, *
R     *20 or 37 by setting the CLOCK switch to *
R     *"STOP". Note that the SEQ PULSE green   *
R     *annunciator is illuminated. If-         *
R     ******************************************
R                 |    |
R                 |    |                  ------------------------------------
R                 |    |                  |With an overcurrent condition     |
R                 OK   NOT OK-------------|simulated, the "CYC FAIL"         |
R                 |                       |annunciator is not illuminated and|
R                 |                       |/or the green and red sequence    |
R                 |                       |annunciators remain illuminated,  |
R                 |                       |i.e., overcurrent protection      |
R                 |                       |circuit malfunctioning - renew    |
R                 |                       |CTPU (34) or (43). If fault does  |
R                 |                       |not clear, renew transformer (35) |
R                 |                       |or (44).                          |
R                 |                       ------------------------------------
R                 |
R   G.******************************************
R     *Repeat the operations detailed in para. *
R     *F. with the rotary FAULT SWITCH at the  *
R     *phase B and then phase C positions.     *
R     *Failures should be rectified as detailed*
R     *for phase A. IF-                        *
R     ******************************************
R                 |
R                 OK
R                 |
R   H.******************************************
R     *EARTH CURRENT PROTECTION                *
R     *Note the pulse or pulses indicated by   *
R     *the illuminated CYCLIC SEQUENCE red     *
R     *annunciator and set the centre CURRENT  *
R     *INHIBIT switch to "INHIBIT".            *
R     *Return the SIM A, SIM B and SIM C       *
R     *switches to 'down', then set the SIM E  *
R     *switch to "ON".                         *
R     *Carefully operate the control adjacent  *
R     *to meter E and check that when the meter*
R     *is indicating between 2 and 4 A, the    *
R     *green and red sequence annunciators are *
R     *extinguished (in this test only,        *
R     *signifying inhibition of the load). Do  *
R     *not readjust the SIM E current setting. *
```

```
R     *Return the SIM E switch to 'down' and   *
R     *set the CLOCK switch to "RUN".           *
R     *Check over at least two complete cycles *
R     *of thirty-eight pulses that the load     *
R     *remains inhibited, i.e., the green and  *
R     *appropriate red sequence annunciators   *
R     *remain extinguished for the duration of *
R     *each pulse noted previously.             *
R     *On panel 4-211, set the MAIN switch to  *
R     *"OFF" and back to "4 SECS-ON", then at  *
R     *the test set, press and release the     *
R     *RESET push-switch. IF-                   *
R     ******************************************
R                |    |
R                |    |           ----------------------------------
R                |    |          |With a simulated earth current of |
R                OK   NOT OK-------|between 2 and 4 A, the green and |
R                |               |red sequence annunciators remain  |
R                |               |illuminated, i.e., earth current  |
R                |               |protection circuit malfunctioning |
R                |               |-renew CTPU (34) or (43). If fault|
R                |               |has not cleared, renew transformer|
R                |               |(36) or (45).                     |
R                |                ----------------------------------
R                |
R   I.******************************************
R     *PROLONGED EARTH CURRENT PROTECTION      *
R     *Set the left and right CURRENT INHIBIT  *
R     *switches to "NORMAL", set the SIM E     *
R     *switch to "ON" and check that the green *
R     *and red sequence annunciators extinguish*
R     *at each pulse for the remainder of the  *
R     *sequence when the pulsing will stop.    *
R     *Set the MAIN selector switch on panel   *
R     *4-211 to "OFF" and then back to "4 SECS-*
R     *ON", then, at the test set, press and   *
R     *release the RESET push-switch.          *
R     *With the green and red sequence         *
R     *annunciators extinguishing at each pulse*
R     *hold depressed the PROL push-switch and *
R     *check that within 1 s, the green and    *
R     *appropriate red sequence annunciators   *
R     *are extinguished and the "CYC FAIL"     *
R     *amber annunciator is illuminated.       *
R     *Release the push-switch.                *
R     *On completion of the check, set the SIM *
R     *E switch to 'down', then press and      *
R     *release the RESET push-switch.          *
R     *On panel 4-211, set the MAIN switch to  *
R     *"OFF". IF-                              *
R     ******************************************
```

```
                 |       |
                 |       |            ------------------------------------
                 |       |           |With a simulated prolonged earth    |
                OK     NOT OK--------|current condition, the "CYC FAIL"   |
                 |                   |annunciator is not illuminated and  |
                 f                   |/or the green and red sequence      |
                 |                   |annunciators remain illuminated,    |
                 |                   |i.e., prolonged earth current       |
                 |                   |protection circuit malfunctioning   |
                 |                   |- renew CTPU (34) or (43). If the   |
                 |                   |fault has not cleared, renew        |
                 |                   |transformer (36) or (45).           |
                 |                    ------------------------------------
                 |
 J.*****************************************
   *POSITIVE SWITCH MATRIX PROTECTION       *
   *On panel 4-211, set the MAIN switch to  *
   *"4 SECS-ON", then stop the system       *
   *cycling at pulse 04 by setting the CLOCK*
   *switch to "STOP".                       *
   *Set the MATRIX 'POS' rotary switch to   *
   *the "P4" position and press and release *
   *the POS push-switch; check that the     *
   *green and appropriate red annunciators  *
   *remain illuminated.                     *
   *Set the MATRIX 'Pos' rotary switch to   *
   *the "P1" position, then press and       *
   *release the POS push-switch; check that *
   *the green and appropriate red           *
   *annunciators are extinguished and the   *
   *"CYC FAIL" amber annunciator is         *
   *illuminated. When the check is completed*
   *set the MAIN switch on panel 4-211 to   *
   *"OFF", and on the test set, set the     *
   *CLOCK switch to "RUN", then press and   *
   *release the RESET push-switch. IF-      *
   *****************************************
                 |       |
                 |       |            ------------------------------------
                 |       |           |With a positive fault injected      |
                OK     NOT OK--------|into the matrix, the "CYC FAIL"     |
                 |                   |amber annunciator is not            |
                 |                   |illuminated and/or the green and    |
                 |                   |red sequence annunciators remain    |
                 |                   |illuminated, i.e., matrix           |
                 |                   |protection circuit malfunctioning   |
                 |                   |- renew CTPU (34) or (43).          |
                 |                    ------------------------------------
                 |
 K.*****************************************
   *Repeat the operations detailed in       *
```

```
R      *paragraph J. with the rotary MATRIX POS *
R      *switch at the "P2" and then "P3"        *
R      *positions.                              *
R      *Failures should be rectified as detailed*
R      *for switch position "P1". IF-           *
R      ******************************************
R                 |
R                 OK
R                 |
R   L.******************************************
R      *NEGATIVE SWITCH MATRIX PROTECTION       *
R      *On panel 4-211, set the MAIN switch to  *
R      *"4 SECS-ON", then stop the system       *
R      *cycling at pulse 05 by setting the CLOCK*
R      *switch to "STOP".                       *
R      *Set the MATRIX NEG rotary switch to     *
R      *"N1"; press and release the NEG push-   *
R      *switch and check that the green and     *
R      *appropriate red sequence annunciators   *
R      *remain illuminated.                     *
R      *Set the MATRIX NEG rotary switch to     *
R      *"N2"; then press and release the NEG    *
R      *push-switch and check that the green and*
R      *appropriate red sequence annunciators   *
R      *are extinguished and the "CYC FAIL"     *
R      *amber annunciator is illuminated.       *
R      *When the check is completed, set the    *
R      *MAIN switch on panel 4-211 to "OFF",then*
R      *at the test set, set the CLOCK switch to*
R      *"RUN" and press and release the RESET   *
R      *push-switch. IF-                        *
R      ******************************************
R                 |    |
R                 |    |                 -----------------------------------
R                 |    |                |With a negative fault injected     |
R                 OK   NOT OK-----------|into the matrix, the "CYC FAIL"    |
R                 |                     |amber annunciators are not         |
R                 |                     |illuminated and/or the green and   |
R                 |                     |red sequence annunciators remain   |
R                 |                     |illuminated, i.e., matrix          |
R                 |                     |protecting circuit malfunctioning  |
R                 |                     |- renew CTPU (34) or (43).         |
R                 |                      -----------------------------------
R                 |
R                 |
R   M.******************************************
R      *Repeat the operations detailed in       *
R      *paragraph L. with the rotary MATRIX NEG *
R      *switch at the "N3", "N4", "N5", "N6" and*
R      *"N7" positions in turn.                 *
R      *Failures should be rectified as detailed*
```

```
   *for switch position "N2". IF-           *
   ******************************************
                |
                OK
                |
N. ******************************************
   *CYCLIC INADVERTENT-ON WARNING           *
   *                                        *
   *WARNING: 200/115 V IS PRESENT AT THE    *
   *         THREE-PHASE CONTACTOR TERMINALS*
   *                                        *
   *On panel 4-211, return the MAIN selector*
   *switch to "OFF"; then ensure that the   *
   *ALTERN and TEST selector switches are at*
   *an "OFF" position.                      *
   *On the test set, return the POWER switch*
   *to 'down', then, at contactors (37) or  *
   *(46), check that the connector mating   *
   *surfaces are clean and replace the      *
   *connector.                              *
   *On the test set, set the POWER switch to*
   *"ON"; then set the right CYCLIC CONTROL *
   *switch to "CYC START" and note that a   *
   *full test cycle of thirty-eight, 0.5 s  *
   *pulses is completed satisfactorily and  *
   *the "CYC FAIL" amber annunciator        *
   *illuminates; then return the right      *
   *CYCLIC CONTROL switch to 'down' and     *
   *check that the "CYC FAIL" amber         *
   *annunciator extinguishes.               *
   *Reset the following circuit breakers:   *
   *At panel 15-216, LH WING CONTN IND,     *
   *H1511, at map reference B15 and at panel*
   *15-215, RH WING CONTN IND, H1512, at map*
   *reference B11.                          *
   *Set the right CYCLIC CONTROL switch to  *
   *"CYC START" and check that the          *
   *"CYC FAIL" amber annunciator is         *
   *illuminated for the remainder of the    *
   *test cycle.                             *
   *When the check is completed, return all *
   *test set controls to the 'down'         *
   *position. IF-                           *
   ******************************************
                |    |
                |    |            ------------------------------------
                |    |           |With a simulated 'cyclic            |
                OK   NOT OK------|inadvertent-on'condition, the       |
                |                |"CYC FAIL" annunciator is not       |
                |                |illuminated = Chart 122.            |
                |                 ------------------------------------
```

```
R                 |
R   O.******************************************
R     *Trip circuit breaker (32) or (41) and   *
R     *then, using suitable adapters, connect a*
R     *shorting-link between terminals B1 and  *
R     *B2 of the left or right control relay of*
R     *continuous heating load 9. Reset circuit*
R     *breaker (32) or (41) and check that the *
R     *INT 1&2 or INT 3&4 caption on panel     *
R     *4-211 is illuminated, then once again,  *
R     *trip the circuit breaker (32) or (41)   *
R     *and remove the shorting-link from the   *
R     *control relay; then, reset the circuit  *
R     *breaker (32) or (41). IF-               *
R     ******************************************
R                 |    |
R                 |    |               ----------------------------------
R                 |    |              |With a simulated 'continuous      |
R                 OK   NOT OK---------|inadvertent-on'condition, the INT |
R                 |                   |1&2 or INT 3&4 caption is not     |
R                 |                   |illuminated - Chart 123.          |
R                 |                    ----------------------------------
R                 |
R   P.******************************************
R     *On panel 4-211, ensure that the system  *
R     *MAIN, ALTERN and TEST selector switches *
R     *are at an 'off' position.               *
R     *On panel 9-211, set the ADC 1 master    *
R     *switch to "OFF" and the ADC 1 TEST      *
R     *selector switch to "NORMAL".            *
R     *At the test set, ensure that all        *
R     *switches are at the 'down' position.    *
R     *Disconnect the test set cables from the *
R     *CTPU (34) or (43).                      *
R     *First ensuring that the mating surfaces *
R     *are clean and undamaged, refit the      *
R     *connectors 1H1839-B and 2H1839-B to the *
R     *CTPU's (34) and (43).                   *
R     *Refit the trim panels and remove all    *
R     *tools and equipment from the underfloor *
R     *baggage compartment.                    *
R     *Re-instate all services isolated in     *
R     *paragraph 2.F.(4).                      *
R     *Remove safety clips and close the       *
R     *circuit breakers (Ref. para. 2.F.(1).   *
R     *Carry out an operational test of the    *
R     *left and right cyclic de-icing (Ref.    *
R     *30-11-00, Adjustment/Test).             *
R     ******************************************
```

```
********************************
*"CYCLIC" CAPTIONS ILLUMINATED*
*AND COUNTERS NOT RESET TO    *
*"00" AT START OF TEST CYCLE. *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TEST SET	TE 6063000
TESTMETER, E.G., AVOMETER TYPE 8	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set the test selector switch to "LH CYC" (RH CYC). ---- Check for a 28 V d.c. output from CB (31) or (40).

- NO --> Renew CB (31) or (40).
- YES --> On panel 4-211, return the TEST selector switch to "OFF". Connect the test set to CTPU (34) or (43) with test cable 1, first ensuring that all the test set controls are in the 'down' position. Set the left and centre CYCLIC CONTROL switches to "NORM CYC" and "ISOL", then set the POWER switch to "ON". Briefly set the right CYCLIC CONTROL switch to "CYC START" to bring the counters back to 00, then set the left and centre CYCLIC CONTROL switches to "TEST CYC" and 'down'. Once again

R

- YES --> At test connector 1H1881, panel 3-131 (2H1881, 3-132), first ensure that there are no a.c. volts present, then check for short-circuits between the pins and between the pins and aircraft earth. Are there any short-circuits?
  - NO
  - YES --> Return the right CYCLIC CONTROL switch to 'down' then referring to the appropriate wiring diagrams, check for short-circuits between the busbars and aircraft earth on the route between contactor

Continued on Sheet 2

Chart 101 (Sheet 1 of 6)

Continued from Sheet 1

set the right CYCLIC CONTROL switch to "CYC START". Has the test cycle stopped with either the amber OVER or amber EARTH annunciator illuminated?

NO

(37) or (46) and the inboard intake switch unit. Rectify as necessary.

Set the left and centre CYCLIC CONTROL switches to "NORM CYC" and "ISOL" then set the centre CURRENT INHIBIT switch to "INHIBIT". Set the right CYCLIC CONTROL switch to "CYC START" and allow the timer to run, then stop the timer on pulse 00, 01, 02 or 03 by setting the CLOCK switch to "STOP" (in this instance, this switch must not remain at STOP for more than 2 min in any 1 h). At test connector 1H1881 (2H1881), first ensure that no a.c. volts are present then check for short-circuits between the pins and between the pins and aircraft earth. Are there any short-circuits?

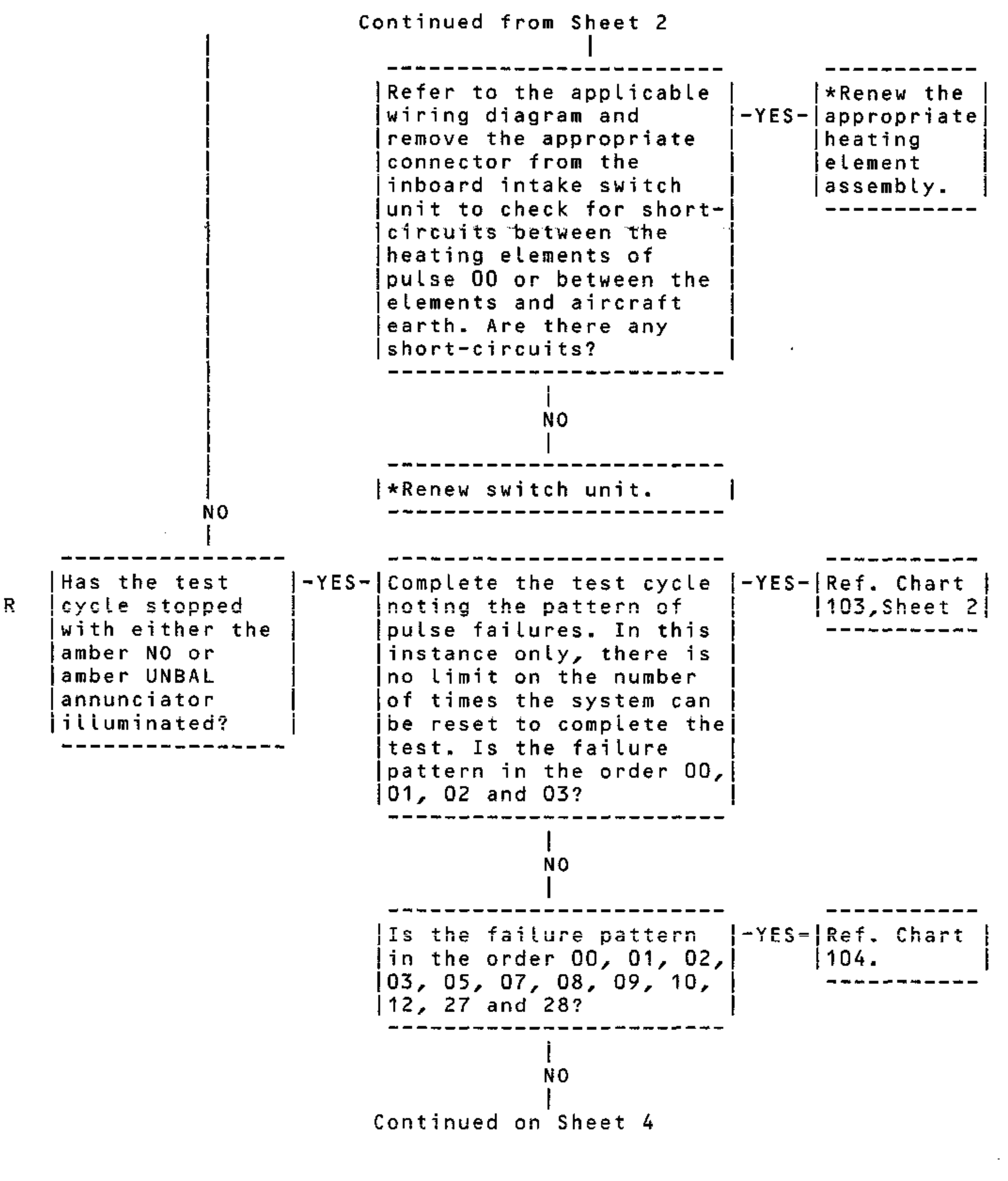
-NO-- (Renew CTPU (34) or (43).

YES

Continued on Sheet 3

Chart 101 (Sheet 2 of 6)

Continued from Sheet 2



Continued on Sheet 4

Chart 101 (Sheet 3 of 6)

Continued from Sheet 3

Is the failure pattern in the order 00, 01, 02, 03, 04, 06 and 21?

- YES → Ref. Chart 108, but for outboard intake switch unit read inboard intake switch unit and for the rotary MATRIX POS switch position P2 read P4.
- NO ↓

Is the failure pattern in the order 00, 01, 02, 03, 05, 07, 08, 09, 10 and 12 or only 27 and 28?

- YES → Ref. Chart 106.
- NO ↓

Is the failure pattern in the order 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 13, 21 and 22, or 00, 01, 02, 03, 05, 06, 07, 08, 09, 10, 13, 21 and 22?

- YES → Return the right CYCLIC CONTROL switch to 'down' and, first ensuring that no a.c. volts are present, check for correct continuity between the pins of test connector 1H1881, panel 3-131 (2H1881, 3-132) and the inboard intake switch unit terminals.
- NO ↓

Continued on Sheet 5

Chart 101 (Sheet 4 of 6)

Continued from Sheet 4

Return right CYCLIC CONTROL switch to 'down', wait 1 min, then set the centre and right CURRENT INHIBIT switches to "INHIBIT" and the right CYCLIC CONTROL switch to "CYC START". While the test cycle is in operation, check for a 3-phase, 200/115 V a.c. output from test socket 1H1881 (2H1881). Are one or two phases missing?

- YES — Renew contactor (37) or (46).
- NO ↓

Are all three phases missing?

- NO — Renew transformer (35) or (44)
- YES ↓

While a test cycle is in operation, remove Relay (38) or (47) and check for 28 V d.c. at pin 8 of the relay socket.

- NO — Renew CTPU (34) or (43)
- YES ↓

Check for continuity between pins 6 and 8 of removed relay (38) or (47).

- YES — *Renew contactor (37) or (46).
- NO ↓

Continued on Sheet 6

Chart 101 (Sheet 5 of 6)

Continued from Sheet 5

R Check for 28 V d.c. at pin 10 of the relay socket. -YES- *Renew relay (38) or (47).

NO

R *Renew switch (19).

Chart 101 (Sheet 6 of 6)

```
********************************
*"CYCLIC" CAPTIONS ARE         *
*ILLUMINATED EVERY ALTERNATE   *
*PULSE.                        *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY - TEST SET	TE 6063000
RESISTANCE METER	CROYDON PRECISION INSTRUMENT

CAUTION: INTAKE CONTACTORS ARE NOT RATED CONTINUOUSLY, THEREFORE THE SWITCH COMBINATIONS SHOULD BE USED AS BRIEFLY AS POSSIBLE.

```
 ------------      ------------------------------          ----------
|Set the TEST|----|Using a suitable adapter, con-|-NO-|Renew con- |
|selector    |    |nect the resistance meter     |    |tactor     |
|switch to   |    |between pins 2 and 3 of test  |    |associated |
|"LH CYC"    |    |socket 1H1881, panel 3-131    |    |with switch|
|(RH CYC).   |    |(2H1881, panel 3-132), then   |    |combination|
 ------------     |check and record the resist-  |    |P1/N1.     |
                  |ance reading.                 |     ----------
                  |                              |
                  |Connect the test set to CTPU  |
                  |(34) or (43) with test cables |
                  |1 and 3, first ensuring that  |
                  |all the test set controls are |
                  |in the 'down' position. Set   |
                  |rotary switch X to "CLOSE CON-|
                  |TACTOR", then set the POWER   |
                  |switch to "ON". Has the res-  |
                  |istance at the meter changed? |
                   ------------------------------
                                 |
                                YES
                                 |
         ----------------------------------------------------
        |Rotate the MATRIX NEG switch through its seven pos- |
        |itions with the MATRIX POS switch at each of its    |
        |four positions, noting the resistance reading at    |
        |each setting. The recorded resistance will reappear |
        |at switch combinations P2/N3 and P2/N5, which are   |
        |not connected to contactors, and a switch combin-   |
        |ation associated with a 'stuck' contactor. Identify |
        |then renew this contactor.                          |
         ----------------------------------------------------
```

Chart 102

```
*******************************
*FAULT ON INDIVIDUAL LOAD     *
*(REF. TABLE 106).            *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TEST SET	TE 6063000
TESTMETER, E.G., AVOMETER TYPE 8	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 ---------     --------------------       ----------------
|Set the  |---|If the suspect load |=YES=|Repair the mat as|
|TEST     |   |incorporates a de-  |     |detailed in      |
|selector |   |icing mat, check the|     |30-12-00 or      |
|switch to|   |mat for obvious     |     |30-21-00, Appro- |
|"LH CYC" |   |faults as detailed  |     |ved Repairs, or  |
|(RH CYC).|   |in 30-12-00 or      |     |renew the appro- |
 ---------    |30-21-00,Inspection/|     |priate heating   |
              |Check. Is there any |     |element assembly |
              |apparent damage?    |     |as required.     |
               --------------------       ----------------
                         |
                         NO
                         |
 -------------------------       ----------------       ----------
|On panel 4-211, return   |-YES-|Refer to the    |-YES-|*Renew    |
|the TEST selector switch |     |appropriate     |     |faulty    |
|to "OFF". Connect the    |     |wiring diagram  |     |heating   |
|test set to CTPU (34) or |     |and check at the|     |element   |
|(43) with test cable 1,  |     |output side of  |     |assembly. |
|ensuring first that all  |     |the contactor/  |      ----------
|the test set controls are|     |switch unit for |
|in the 'down' position.  |     |short-circuits  |
|Set the POWER switch to  |     |between the sus-|
|"ON", the left and right |     |pect load and   |
|CYCLIC CONTROL switches  |     |aircraft earth, |
|to "TEST CYC" and "CYC   |     |first ensuring  |
|START", then carry out a |     |that there are  |
|full test cycle. Is the  |     |no a.c. volts   |
|amber EARTH annunciator  |     |present. Are    |
|illuminated?             |     |there any short-|
 -------------------------      |circuits?       |
                                 ----------------
```

Continued on Sheet 2

Chart 103 (Sheet 1 of 2)

Continued from Sheet 1

NO — (left branch from Sheet 1)

NO — (right branch from Sheet 1)

Renew contactor/switch unit.

Has either the amber NO or amber UNBAL annunciator become illuminated during the test?

-YES- Refer to the appropriate wiring diagram and check the resistance (Ref. Table 107) of the suspect load from the output side of its contactor, first ensuring that there are no a.c. volts present. Are the resistances within the quoted range?

-YES- *Renew the contactor/switch unit.

NO

Repair the heating element or *renew the heating element assembly, as required?

Chart 103 (Sheet 2 of 2)

```
********************************
*SUSPECTED FAILURE OF POSITIVE*
*D.C. OUTPUT SWITCH IN CTPU OR*
*MATRIX WIRING (REF. TABLE    *
*106).                        *
********************************
```

GROUND EQUIPMENT REQUIRED

DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TEST SET	TE 6063000
TESTMETER, E.G., AVOMETER TYPE 8	-

Set the TEST selector switch to "LH CYC" (RH CYC).

→ On panel 4-211, return the TEST selector switch to "OFF". Connect the test set to CTPU (34) or (43) with test cables 1 and 2, ensuring first that all the test set controls are in the 'down' position. Set the centre CURRENT INHIBIT switch to "INHIBIT", then set the POWER switch to "ON". Finally, set the left and right CYCLIC CONTROL switches to "TEST CYC" and "CYC START" and complete a full test cycle. Has the amber MATRIX annunciator become illuminated during the test?

-YES- → Renew CTPU (34) or (43).

NO

Continued on Sheet 2

Chart 104 (Sheet 1 of 3)

Continued from Sheet 1

Were all the pulses indicated in the test?

-NO- → Return the right CYCLIC CONTROL switch to 'down', then connect test cable 3. Set switch X to "EARTHS" and then rotate the MATRIX POS switch through its four positions. Has the red POS annunciator become illuminated at any of the switch positions?

-YES- → Make a note of the switch position that accompanied illumination of the POS annunciator, then check which contactors are connected to that positive switch. Refer to the appropriate wiring diagrams and check for any short-circuits between the affected positive switch matrix wiring, or contactor coils, and aircraft earth. Rectify as necessary.

NO → Set switch X to "CLOSE CONTACTOR"; then, observing the COIL CURRENT meter, rotate the MATRIX NEG switch through its seven positions with the MATRIX POS switch at each of its four positions. If at any time the test set CB trips or the coil current indicated is appreciable more than 1 A, make a note of the P/N switch combination. Identify the faulty contactor/switch unit from the P/N combination, then renew the contactor/switch unit and the CTPU (34) or (43).

YES (from "Were all the pulses indicated in the test?") ↓

Continued on Sheet 3

Chart 104 (Sheet 2 of 3)

Continued from Sheet 2

Return the right CYCLIC CONTROL switch to 'down', then connect test cable 3. Set the right CYCLIC CONTROL switch to "CYC START" and carry out a complete test cycle. Has the amber MATRIX annunciator become illuminated during the test?

-YES-

Return the right CYCLIC CONTROL switch to 'down', set switch X to "DIODES", then rotate the MATRIX NEG switch through its seven positions. Have any of the red P1, P2,P3 or P4 annunciators become illuminated?

-YES-

Make a note of the setting of the MATRIX NEG switch that accompanied illumination of the annunciator, then check which contactors are connected to that negative switch Refer to the appropriate wiring diagrams and disconnect the coil of each affected contactor in turn until the red annunciator is extinguished. Renew the faulty contactor.

NO

Set switch X to "COUPLING" and then rotate the MATRIX POS switch through its four positions. If more than one of the red P1,P2,P3 and P4 annunciators are illuminated, this is an indication that coupling, i.e., short-circuiting is occurring between the indicated positive switches. Refer to the appropriate wiring diagrams and check for coupling in the positive switch matrix wiring. Rectify as necessary.

Chart 104 (Sheet 3 of 3)

```
********************************
*SUSPECTED FAILURE OF NEGATIVE*
*D.C. OUTPUT SWITCH IN CTPU OR*
*MATRIX WIRING (REF. TABLE    *
*106).                        *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY - TEST SET	TE 6063000

```
 -----------      ----------------------------------      -----------
|Set the    |----|On panel 4-211, return the       |-YES-|Renew CTPU |
|TEST       |    |TEST selector switch to "OFF"    |     |(34) or    |
|selector   |    |Connect the test set to CTPU     |     |(43).      |
|switch to  |    |(34) or (43) with test cables    |      -----------
|"LH CYC"   |    |1 and 2, first ensuring that     |
|(RH CYC).  |    |all the test set controls are    |
 -----------     |in the 'down' position. Set      |
                 |the centre CURRENT INHIBIT       |
                 |switch to "INHIBIT", then set    |
                 |the POWER switch to "ON".        |
                 |Finally, set the left and        |
                 |right CYCLIC CONTROL switches    |
                 |to "TEST CYC" and "CYC START"    |
                 |and complete a full test         |
                 |cycle. Has the amber MATRIX      |
                 |annunciator become illumin-      |
                 |ated during the test?            |
                  ----------------------------------
                       |
                       NO
```

Continued on Sheet 2

Chart 105 (Sheet 1 of 3)

Continued from Sheet 1

Were all the pulses indicated in the test cycle?

-NO- Return the right CYCLIC CONTROL switch to 'down'; then connect test cable 3. Set switch X to "CLOSE CONTACTOR"; then, observing the COIL CURRENT meter, rotate the MATRIX NEG switch through its seven positions with the MATRIX POS switch at each of its four positions. If at any time the test set CB trips or the coil current indicated is appreciably more than 1 A, make a note of the P/N switch combination. Identify the faulty contactor/switch unit from the P/N combination; then renew the faulty contactor/switch unit, and the CTPU (34) or (43).

YES

Return the right CYCLIC CONTROL switch to 'down', then connect test cable 3. Set switch X to "EARTHS" and then rotate the MATRIX NEG switch through its seven positions. Has the red NEG annunciator become illuminated at any of the switch positions?

-YES- Make a note of the switch setting that accompanied illumination of the NEG annunciator, then check which contactors are connected to that negative switch. Refer to the appropriate wiring diagrams and check for short-circuits between the affected negative switch matrix wiring, or contactor coils, and aircraft earth. Rectify as necessary.

NO

Continued on Sheet 3

Chart 105 (Sheet 2 of 3)

Continued from Sheet 2

Refer to the appropriate wiring diagrams and check for coupling, i.e. short-circuiting, between the seven negative switches in the matrix wiring. Rectify as necessary.

Chart 105 (Sheet 3 of 3)

****
*SUSPECT CONNECTION ON CTPU *
*OUTPUT CONNECTOR (REF. *
*TABLE 106). *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TEST SET	TE 6063000
TESTMETER, E.G., AVOMETER TYPE 8	-

Set the TEST selector switch to "LH CYC" (RH CYC).

---- On panel 4-211, return the TEST selector switch to "OFF". Connect the test set to CTPU (34) or (43) with test cables 1 and 2, first ensuring that all the test set controls are in the 'down' position. Set the POWER switch to "ON" and the centre CURRENT INHIBIT switch to "INHIBIT", then set the left and right CYCLIC CONTROL switches to "TEST CYC" and "CYC START". Carry out a complete test cycle. Have all the pulses been indicated correctly?

-NO- Renew CTPU (34) or (43).

YES

R Refer to the appropriate wiring diagrams and check the integrity of all the matrix wiring from free connector 1H1839-B (2H1839-B) at CTPU (34) or (43). Rectify as necessary.

Chart 106

FAULT ON CURRENT TRANSFORMER CHANGE-OVER PULSES (REF. TABLE 106).

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY - TEST SET	TE 6063000

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set the TEST selector switch to "LH CYC" (RH CYC).

On panel 4-211, return the TEST selector switch to "OFF". Connect the test set to CTPU (34) or (43) with test cables 1 and 2, first ensuring that all the test set controls are in the 'down' position. Set the POWER switch to "ON" and the centre CURRENT INHIBIT switch to "INHIBIT", then set the left and right CYCLIC CONTROL switches to "TEST CYC" and "CYC START". Carry out a complete test cycle. Have pulses 04 and 11 been indicated?

- NO: Renew CTPU (34) or (43).
- YES: Renew the associated change-over relay. If fault does not clear, *renew the associated single-phase current transformer.

Chart 107

```
********************************
*SUSPECT CONNECTION ON CTPU OR*
*OUTBOARD INTAKE SWITCH UNIT  *
*(REF. TABLE 106).            *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TEST SET	TE 6063000
TESTMETER, E.G., AVOMETER TYPE 8	-

```
 -----------       -------------------------------------         ----------
|Set the    |     |On panel 4-211, return the TEST      |       |Renew     |
|TEST       |-----|selector switch to "OFF".            |-YES-  |CTPU (34) |
|selector   |     |Connect the test set to CTPU         |       |or (43).  |
|switch to  |     |(34) or (43) with test cables 1      |        ----------
|"LH CYC"   |     |and 2, first ensuring that all       |
|(RH CYC).  |     |the test set controls are in the     |
 -----------      |'down' position. Set the POWER       |
                  |switch to "ON" and the centre        |
                  |and right CURRENT INHIBIT            |
                  |switches to "INHIBIT", then set      |
                  |the left and right CYCLIC            |
                  |CONTROL switches to "TEST CYC"       |
                  |and "CYC START". Carry out a         |
                  |complete test cycle. Was the         |
                  |amber MATRIX annunciator             |
                  |illuminated during the test?         |
                   -------------------------------------
                      |
                      NO
                      |
    ---------------------         -----------
   |Were all the pulses  |-NO--|Ref. Chart |
   |indicated correctly  |     |105.       |
   |during the test?     |      -----------
    ---------------------
              |
             YES
```

Continued on Sheet 2

Chart 108 (Sheet 1 of 2)

Continued from Sheet 1

R R R R R R

Connect test cable 3 and set the MATRIX POS and MATRIX NEG switches to P2 and N4, then briefly set switch X to "CLOSE CONTACTOR". Has the COIL CURRENT meter indicated approximately 1 A?

-NO- Refer to the appropriate wiring diagrams and check the integrity of the matrix wiring from free connector 1H1839-B (2H1839-B) at CTPU (34) or (43). Rectify as necessary.

YES

Check the integrity of the 3-phase busbar input to the outboard intake switch unit. Rectify as necessary.

Chart 108 (Sheet 2 of 2)

```
********************************
*"CYCLIC" CAPTIONS NOT         *
*ILLUMINATED AT END OF TEST    *
*CYCLE.                        *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TEST SET	TE 6063000
TESTMETER, E.G., AVOMETER TYPE 8	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 -----------     ------------------------------         ----------
|Set the TEST|   |Check for a 28 V d.c. output  |      |Renew CB  |
|selector    |---|from CB (33) or (42).         |-NO-  |(33) or   |
|switch to   |    ------------------------------       |(42).     |
|"LH CYC"    |                  |                       ----------
|(RH CYC).   |                 YES
 -----------                    |
                  ------------------------------        ----------
                 |Connect the test set to CTPU  |-NO-  |*Renew    |
R                |(34) or (43) with test cable 1|      |switch    |
                 |first ensuring that all the   |      |(19).     |
                 |test set controls are in the  |       ----------
                 |'down' position. Is the amber |
                 |FAIL annunciator illuminated? |
                  ------------------------------
                                |
                               YES
                                |
                  -------------------------------
                 |Refer to the appropriate wiring|
                 |diagrams and check the wiring  |
R                |between switch (19) and the    |
                 |CYCLIC captions. Rectify as    |
                 |necessary.                     |
                  -------------------------------
```

Chart 109

"CYCLIC" CAPTION(S) ILLUMINATED INTERMITTENTLY, I.E., ONLY ON SOME TEST CYCLES.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY - TEST SET	TE 6063000

Set the TEST selector switch to "LH CYC" (RH CYC).

On panel 4-211, return the TEST selector switch to "OFF" Connect the test set to CTPU (34) or (43) with test cable 1, first ensuring that all the test set controls are in the 'down' position. Set the left CYCLIC CONTROL and POWER switches to "TEST CYC" and "ON", then, using the right CYCLIC CONTROL switch as required, carry out several complete test cycles. Has a test cycle been stopped with the amber NO annunciator illuminated?

-YES- Note the pulse indicated and renew the associated contactor/switch unit

NO

Has the test cycle been stopped with the amber PROL annunciator illuminated?

-YES- Note the pulse indicated, then renew the contactor (or switch unit) associated with the previous pulse.

NO

Continued on Sheet 2

Chart 110 (Sheet 1 of 2)

Continued from Sheet 1

Return the right CYCLIC CONTROL switch to 'down', then set the left and centre CYCLIC CONTROL switches to "NORM CYC" and "ISOL". Set the centre CURRENT INHIBIT switch to "INHIBIT", then set the right CYCLIC CONTROL switch to "CYC START" and carry out several complete normal cycles of the system to simulate in-flight conditions.

With the contactor coils still warm, return the right CYCLIC CONTROL switch to 'down', then set the left and centre CYCLIC CONTROL switches to "TEST CYC" and 'down'. Next, set the centre CURRENT INHIBIT switch to "NORMAL", and the right cyclic CONTROL switch to "CYC START" and carry out a complete test cycle. Was the amber NO annunciator illuminated?

-YES- Note the pulse indicated and renew the associated contactor/switch unit.

NO

If the test cycle is stopped with the amber PROL annunciator illuminated, renew the contactor (or switch unit) associated with the pulse previous to that indicated.

Chart 110 (Sheet 2 of 2)

****
*"INT 1&2" or "INT 3&4" *
*CAPTION ILLUMINATED WITH *
*SYSTEM SWITCHED OFF. *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TESTMETER, E.G., AVOMETER TYPE 8	-
INSULATION RESISTANCE METER (BATTERY CONTROLLED)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Check that the INT 1&2 and INT 3&4 captions are not illuminated. ---- Break the connection between contacts B1 and B2 of each of the five associated control relays in turn. Has the caption been extinguished? -YES- Sticking of the control relay could have damaged the heating elements, therefore refer to the appropriate wiring diagrams and Table 108 and check that the elements controlled by the faulty relay are of the correct resistance, and have an insulation resistance to aircraft earth of at least 2 Mohm. Repair or *renew any faulty heating element assemblies, then *renew the faulty control relay.

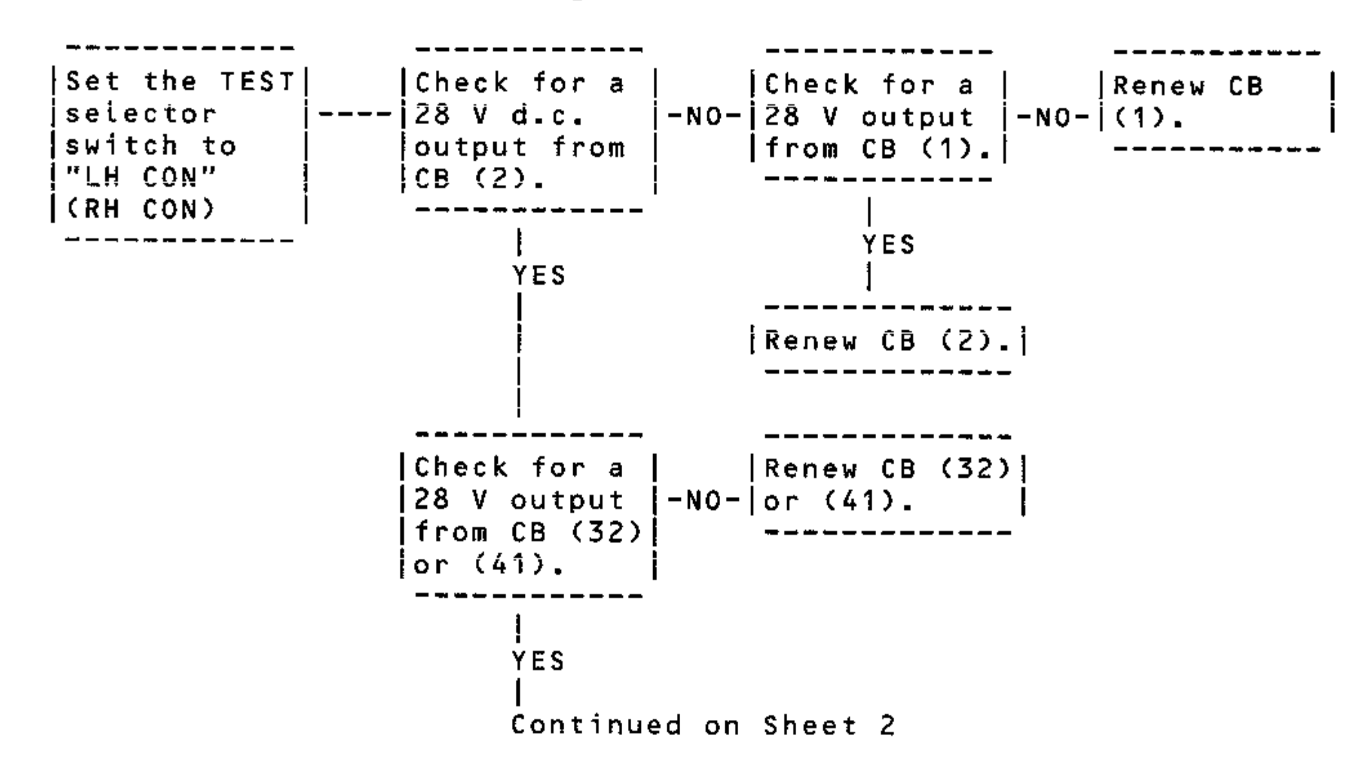
Chart 111

```
*******************************
*NO CAPTIONS ILLUMINATED      *
*DURING SECOND 3 s TEST PERIOD*
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TESTMETER, E.G., AVOMETER TYPE 8	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

The delays on certain relays will have to be taken into account when checking for 28 V d.c.



Continued on Sheet 2

Chart 112 (Sheet 1 of 2)

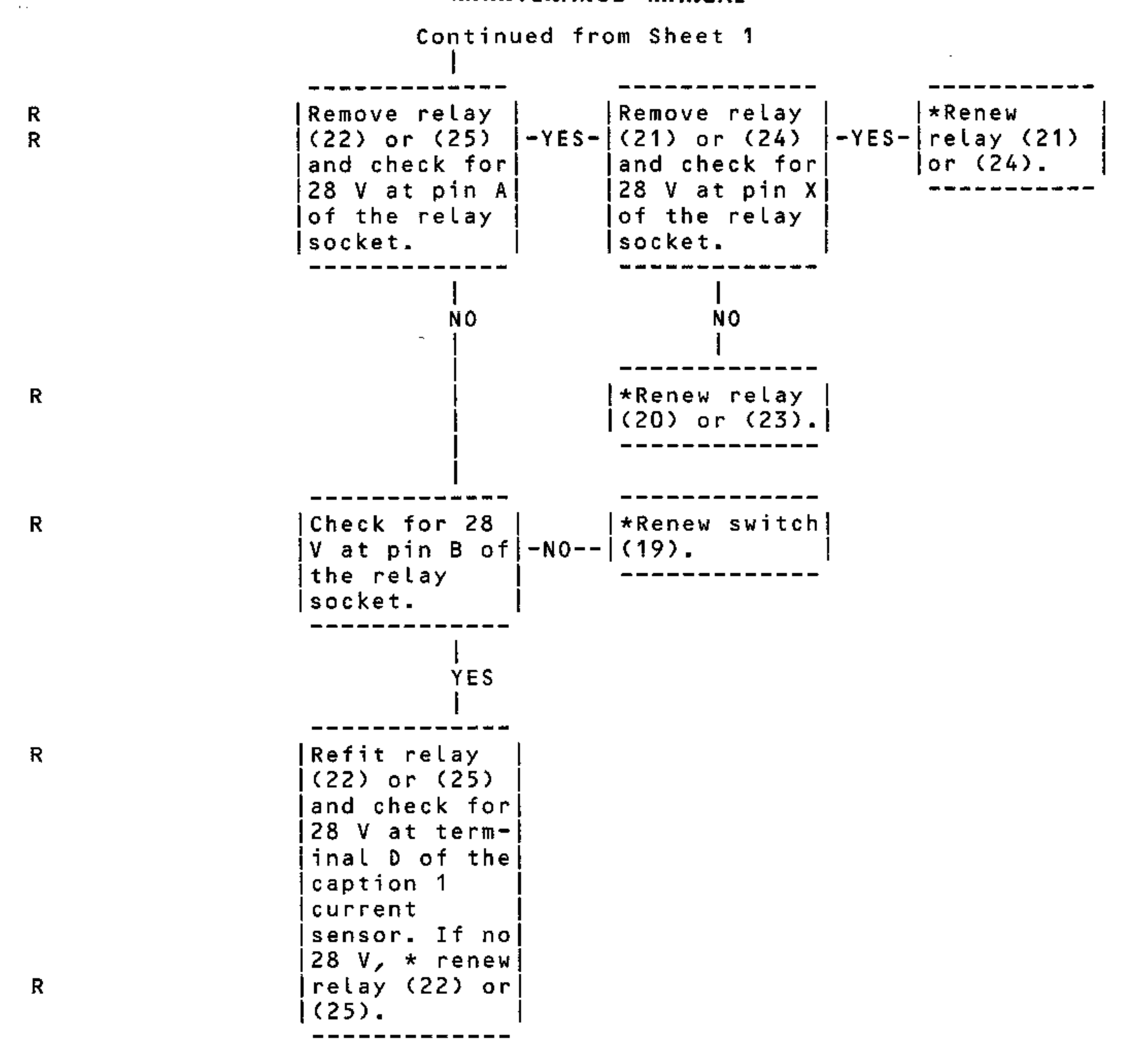


Chart 112 (Sheet 2 of 2)

****
*ONE OF THE FIRST EIGHT *
*NUMBERED CAPTIONS AND AN *
*"INT 1&2" OR "INT 3&4" *
*CAPTION ILLUMINATED FOR THE *
*FIRST 3 s TEST PERIOD. *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TESTMETER, E.G., AVOMETER TYPE 8	-
RESISTANCE METER	CROYDON PRECISION INSTRUMENT TYPE PW2

NOTE: Before renewal of components (*), check the associated wiring for continuity.

R Set the TEST selector switch to "LH CON" (RH CON).

On panel 4-211, return the TEST selector switch to "OFF". Check for a 115 V a.c. output from the CB of the suspect load.
-NO- Renew faulty CB.

YES

Refer to the appropriate wiring diagram and check the resistance (Ref. Table 108) of the elements in the suspect load. Is the resistance satisfactory?
-NO- *Renew the faulty element assembly.

YES

Provided more than 2 min 30 s have passed since the last test, set the TEST selector switch to "LH CON" (RH CON) and, within 3 s, check for 115 V a.c. at terminal A of the current sensor of the suspect load.
-NO- *Renew the control relay of the suspect load.
-YES- Renew the current sensor of the suspect load.

Chart 113

```
*******************************
*NUMBERED CAPTION "9" OR "10" *
*AND AN "INT 1&2" OR "INT 3&4"*
*CAPTION ILLUMINATED FOR THE  *
*FIRST 3 s TEST PERIOD.       *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TESTMETER, E.G., AVOMETER TYPE 8	-
RESISTANCE METER	CROYDON PRECISION INSTRUMENT TYPE PW2

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 ------------        ------------        ------------
|Set the TEST|      |On panel    |      |Renew faulty|
|selector    |----|4-211,      |-NO-|CB.         |
|switch to   |      |return the  |       ------------
|"LH CON"    |      |TEST select-|
|(RH CON).   |      |or switch to|
 ------------       |"OFF". Check|
R                   |for a 115 V |
R                   |a.c. output |
                    |from the CB |
                    |of the      |
                    |suspect load|
                     ------------
                          |
                         YES
                          |
 ------------------------------        ------------
|Refer to the appropriate      |      |Check the   |
|wiring diagram and check the  |-NO-|suspect de- |
|resistance (Ref. Table 108)   |      |icing mat   |
|of the elements in the sus-   |      |for obvious |
|pect load. Is the resistance  |      |damage (Ref.|
|satisfactory?                 |      |30-21-00,   |
 ------------------------------       |Inspection/ |
          |                           |Check).     |
          |                           |Repair if   |
         YES                          |possible,   |
          |                           |or *renew   |
  Continued on Sheet 2                |the assembly|
                                       ------------
```

Chart 114 (Sheet 1 of 2)

Continued from Sheet 1

Provided more than 2 min 30 s have passed since the last test, set the TEST selector switch to "LH CON" (RH CON) and, within 3 s, check for 115 V a.c. at terminal A of the current sensor of the suspect load.

-NO- Remove the associated control relay and check for an earth on pin X2 of the relay socket.

-NO- Refit the relay, then check the operation and setting of the associated control microswitch (Ref. 71-64-12, Adjustment/Test). Re-adjust or *renew as necessary.

YES: *Renew associated control relay.

YES (from first box):

Remove the associated indication relay and check for an earth on pin 3 of the relay socket.

-NO- Refit the relay, then check the operation and setting of the associated indication microswitch (Ref. 71-64-12, Adjustment/Test). Readjust or *renew as necessary.

YES: *Renew associated indication relay.

Chart 114 (Sheet 2 of 2)

****
*INDIVIDUAL NUMBERED CAPTION *
NOT ILLUMINATED DURING SECOND
*3 s TEST PERIOD. *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

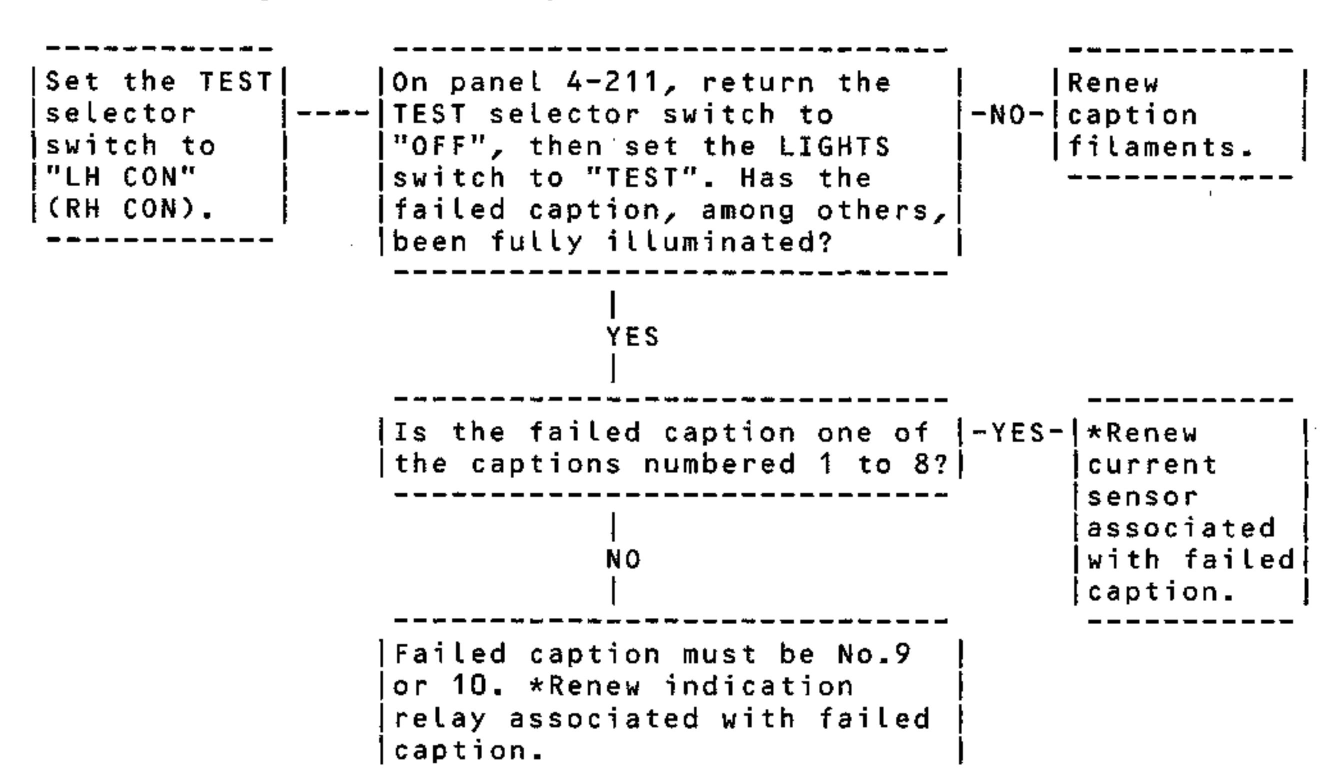


Chart 115

SYSTEM INOPERATIVE WITH MAIN CONTROL LINE SELECTED.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TESTMETER, E.G., AVOMETER TYPE 8	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

R Set the MAIN selector switch to "4 SECS - ON".

R Remove relay (49) and check for continuity between pin C3 of the relay socket and the input side of CB (3).

- NO → Remove relay (50) and check for 28 V d.c. at pin X1 of relay socket.
  - NO → Suspect control circuit of relay (50). Ref. 30-31-00.
  - YES → *Renew relay (50).
- R YES → Check for 28 V d.c. at pin C2 of the relay socket.
  - R NO → Remove relay (8) and check for 28 V d.c. at pin X1 of the relay socket.
    - R NO → *Renew switch (7).
    - YES → *Renew relay (8).
  - R YES → *Renew relay (49).

Chart 116

R *SYSTEM OPERATING, BUT OUTSIDE ELAPSED TIME LIMITS ON ONE CYCLIC SYSTEM.*

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TESTMETER, E.G., AVOMETER TYPE 8	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
R   -----------------         -----------------         -----------------
R  |Set the MAIN     |       |Was the elapsed  |-YES-|Renew CTPU (34)  |
R  |selector switch  |-------|time less than   |     |or (43).         |
R  |to "4 SECS - ON".|       |2 min 17 s?      |      -----------------
R   -----------------         -----------------
R                                     |
R                                     NO
R                                     |
                              -----------------         -----------------
                             |Disconnect       |     |*Renew switch    |
                             |connector        |-NO--|(7).             |
                             |1H1839-C or      |      -----------------
                             |2H1839-C from    |
                             |CTPU (34) or (43)|
                             |and check for    |
                             |28 V d.c. at     |
                             |pin C of the free|
                             |connector.       |
                              -----------------
                                    |
                                   YES
                                    |
                              -----------------         -----------------
                             |Check for 28 V   |     |Renew CTPU (34)  |
                             |d.c. at pin D of |-NO--|or (43).         |
                             |the free         |      -----------------
                             |connector.       |
                              -----------------
                                    |
                                   YES
                                    |
                              -----------------
R                            |*Renew switch    |
                             |(7).             |
                              -----------------
```

Chart 117

```
********************************
*ONE CYCLIC COUNTER NOT        *
*RESETTING TO "00" AT START OF*
*NORMAL HEATING CYCLE.         *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY TEST SET	TE 6063000
TESTMETER, E.G., AVOMETER TYPE 8	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 ------------      -----------------------------            -----------
|Set the MAIN|    |On panel 4-211, return the   |          |Renew CTPU |
|selector    |----|MAIN selector switch to      |-YES-|(34) or    |
|switch to "4|    |"OFF". Connect the test set  |          |(43).      |
|SECS - ON". |    |to CTPU (34) or (43) with    |           -----------
 ------------     |test cable 1, first ensuring |
                  |that all the test set        |
                  |controls are in the 'down'   |
                  |position. Once again set the |
                  |MAIN selector switch to "4   |
                  |SECS - ON". Is the green NORM|
                  |CYC annunciator illuminated? |
                   -----------------------------
                                |
                                NO
                                |
                   -----------------------------
                  |Check for a 28 V d.c. output |
                  |from CB (3) or (5). *Renew   |
                  |as necessary.                |
                   -----------------------------
```

Chart 118

****
*SYSTEM INOPERATIVE WITH *
*ALTERNATIVE CONTROL LINE *
*SELECTED. *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TESTMETER, E.G., AVOMETER TYPE 8	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

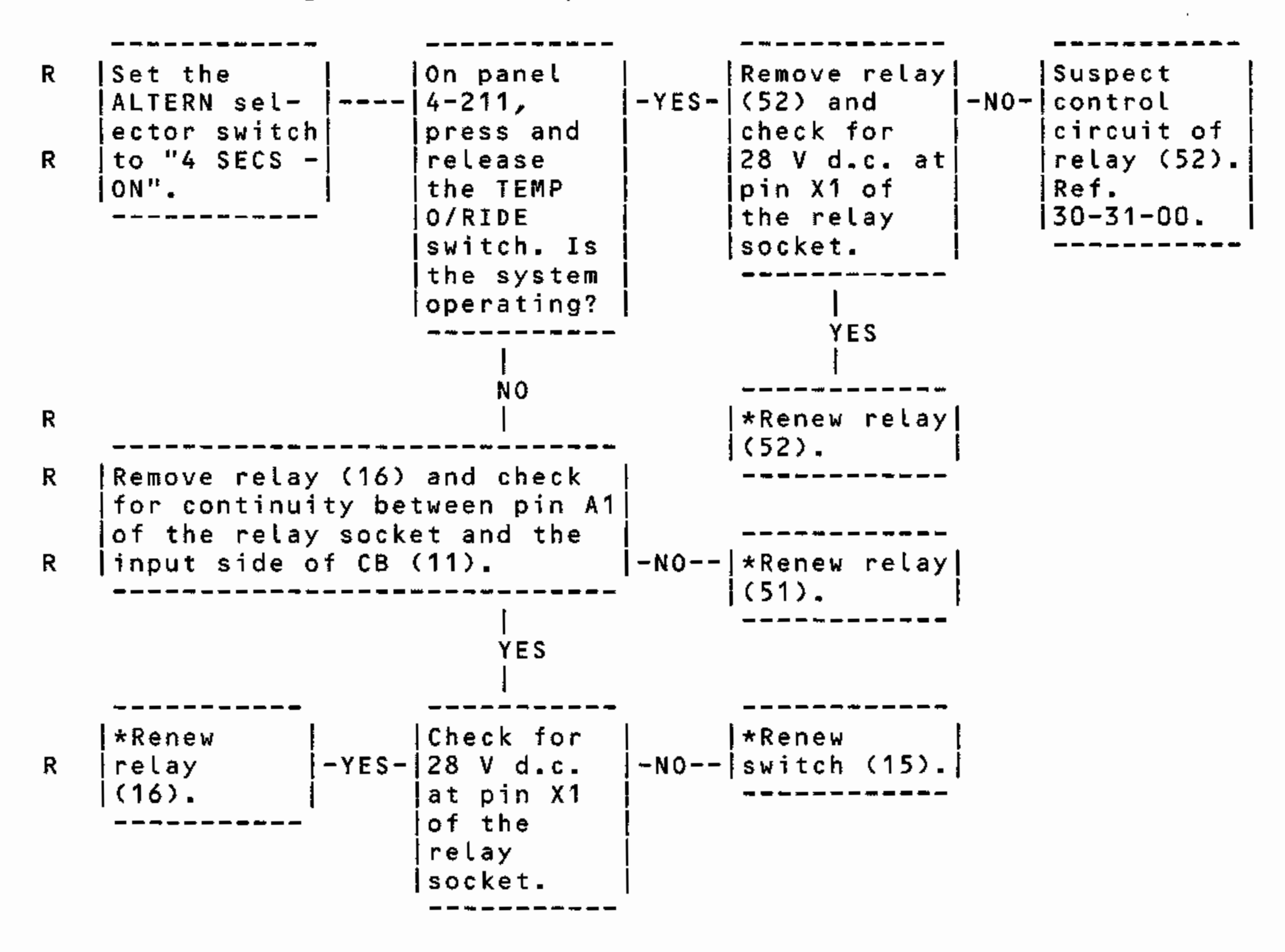


Chart 119

```
    ********************************       --------------------------------
R   *SYSTEM OPERATING, BUT OUT-    *      |GROUND EQUIPMENT REQUIRED       |
R   *SIDE ELAPSED TIME LIMITS      *      |--------------------------------|
R   *INCORRECT PULSE DURATION ON   *      |DESCRIPTION           PART NO.  |
R   *ONE CYCLIC SYSTEM.            *      |--------------------------------|
R   ********************************      |GROUND POWER SUPPLY   -         |
                                          |TESTMETER, E.G.,      -         |
                                          |AVOMETER TYPE 8                 |
                                           --------------------------------
```

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
R    -----------------        -----------------        -----------------
R   |Set the ALTERN   |      |Was the elapsed  |-YES-|Renew CTPU (34)  |
R   |selector switch  |------|time less than   |     |or (43).         |
R   |to "4 SECS - ON".|      |2 min 17 s?      |      -----------------
R    -----------------        -----------------
R                                    |
R                                    NO
R                                    |
                              -----------------        -----------------
                             |Disconnect       |     |Renew switch     |
                             |connector        |-NO--|(15).            |
                             |1H1839-C or      |      -----------------
                             |2H1839-C from    |
                             |CTPU (34) or (43)|
                             |and check for    |
                             |28 V d.c. at     |
                             |pin C of the free|
                             |connector.       |
                              -----------------
                                    |
                                   YES
                                    |
                              -----------------        -----------------
                             |Check for 28 V   |     |Renew CTPU (34)  |
                             |d.c. at pin D of |-NO--|or (43).         |
                             |the free         |      -----------------
                             |connector.       |
                              -----------------
                                    |
                                   YES
                                    |
                              -----------------
R                            |*Renew switch    |
                             |(15).            |
                              -----------------
```

Chart 120

"CYC FAIL" ANNUNCIATOR FAILS TO REMAIN ILLUMINATED, I.E., FAULTY LATCH-OUT CIRCUIT.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER, E.G., AVOMETER TYPE 8	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

R R Set the centre CYCLIC CONTROL switch to "ISOL" for at least 2 s, then return it to 'down'.

→ Remove relay (39) or (48); then return the centre CYCLIC CONTROL switch to "ISOL" and check for 28 V d.c. at pin X of the relay socket.
- NO → *Renew contactor (37) or (46).
- YES ↓

R R R Refit relay (39) or (48) and check for a 28 V d.c. input to terminal 6 of caption (28) or (29).
- NO → *Renew relay (39) or (48).
- YES ↓

R Check for a 28 V d.c. output from terminal 1 of caption (28) or (29).
- NO → Renew caption (28) or (29).
- YES ↓

R Renew relay (38) or (47).

Chart 121

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```
********************************
*WITH A SIMULATED 'CYCLIC IN- *
*ADVERTENT-ON' CONDITION, THE *
*'CYC FAIL' ANNUNCIATOR IS NOT*
*ILLUMINATED.                 *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER, E.G., AVOMETER TYPE 8	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 ------------    ------------------------------        -----------
|Set the     |  |Has the caption failed to     |      |*Renew     |
R |right CYC-  |--|become illuminated at only   |-YES-|switch (19)|
|LIC CONTROL |  |one 'off' position of the     |       -----------
|switch to   |  |TEST selector switch?         |
|"CYC START" |   ------------------------------
|and carry   |                |
|out a full  |                NO
|test cycle. |                |
|Approxi-    |   ------------------------------       -----------
|mately      |  |Check for a 28 V d.c. output  |      |Renew CB   |
|half-way    |  |from CB (32) or (41).         |--NO-|(32) or    |
|through the |   ------------------------------      |(41).      |
|cycle, set  |                |                        -----------
|the TEST    |                YES
|selector    |                |
|switch to   |   ------------------------------       -----------
|the altern- |  |Disconnect the connector from |      |*Renew     |
R |ative 'off' |  |contactor (37) or (46) and    |-YES-|contactor  |
|position.   |  |check for 28 V d.c. at pin M  |      |(37) or    |
 ------------   |of the free connector.        |      |(46).      |
                 ------------------------------        -----------
                               |
                               NO
                               |
```

Continued on Sheet 2

Chart 122 (Sheet 1 of 2)

Continued from Sheet 1

```
                              |
                              NO
                              |
     ------------------------------         -----------
     |Refit the connector; then    |        |*Renew     |
R    |check for a 28 V d.c. output |--NO-|switch (7).|
     |from terminal 4A of module   |        -----------
     |block UM 2013, or terminal 5C|
     |of module block UM 2077. (The|
     |module blocks are located on |
     |the rear of the rear switch  |
     |panel portion of panel       |
     |4-211).                      |
     ------------------------------
                              |
                              YES
                              |
     ------------------------------         -----------
     |Check for a 28 V d.c. output |        |*Renew     |
R    |from terminal 3A of module   |--NO-|switch (15)|
     |block UM 2013, or terminal 4A|        -----------
     |of module block UM 2077.     |
     ------------------------------
                              |
                              YES
                              |
     ------------------------------
R    |*Renew switch (19).          |
     ------------------------------
```

Chart 122 (Sheet 2 of 2)

```
********************************         ---------------------------------
*WITH A SIMULATED 'CONTINUOUS *         |GROUND EQUIPMENT REQUIRED        |
*INADVERTENT-ON' CONDITION,    *        |---------------------------------|
*THE 'INT 1&2' or 'INT 3&4'    *        |DESCRIPTION             PART NO. |
*CAPTION IS NOT ILLUMINATED.   *        |---------------------------------|
********************************        |GROUND POWER SUPPLY     -        |
                                        |MULTIMETER, E.G.,       -        |
                                        |AVOMETER TYPE 8                  |
                                         ---------------------------------
```

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
     -----------        -----------------------------         -----------
    |Connect a  |      |Has the system undergone and |       |Check wir- |
    |shorting-  |------|passed a 'cyclic inadvertent-|-YES-|ing between|
R   |link bet-  |      |on' test (Ref. para.7.N.)?   |       |caption    |
    |ween termi-|       -----------------------------        |(26) or    |
    |nals B1    |                    |                       |(27) and   |
R   |and B2 of  |                    NO                      |switch (19)|
    |a contin-  |                    |                        -----------
    |uous heat- |       -----------------------------
    |ing control|      |Has the caption failed to    |        -----------
    |relay; then|      |become illuminated at only   |-YES-|*Renew     |
R   |reset CB   |      |one 'off' position of the    |       |switch (19)|
    |(32) or    |      |TEST selector switch?        |        -----------
    |(41).      |       -----------------------------
     -----------                     |
                                     NO
                                     |
                        -----------------------------         -----------
                       |Check for a 28 V d.c. output |       |*Renew     |
R                      |from terminal 4A of module   |--NO-|switch (7).|
                       |block UM 2013, or terminal 5C|        -----------
                       |of module block UM 2077. The |
                       |module blocks are located on |
                       |the rear of the rear switch  |
                       |panel portion of panel 4-211.|
                        -----------------------------
                                     |
                                     YES
                                     |
```

Continued on Sheet 2

Chart 123 (Sheet 1 of 2)

Continued from Sheet 1

YES

R Check for a 28 V d.c. output from terminal 3A of module block UM 2013, or terminal 4A of module block UM 2077.

--NO-- *Renew switch (15)

YES

R *Renew switch (19).

Chart 123 (Sheet 2 of 2)

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
Control Selection Equipment (Main)						
(1) Circuit breaker 28 V	-	15-215	1H1836	Map ref.D10	24-50-00 R/I	30-11-01
(2) Circuit breaker 28 V	-	15-215	1H1826	Map ref.D11	24-50-00 R/I	30-11-01
(3) Circuit breaker 28 V	-	15-215	1H1827	Map ref.F12	24-50-00 R/I	30-11-01
(4) Circuit breaker 28 V	-	15-215	1H1833	Map ref.F10	24-50-00 R/I	30-11-01
(5) Circuit breaker 28 V	-	15-216	2H1827	Map ref.F18	24-50-00 R/I	30-11-01
(6) Circuit breaker 28 V	-	15-216	2H1833	Map ref.F16	24-50-00 R/I	30-11-01
(7) Main selector switch	-	4-211	H1837	Flt. compt. roof panel	30-00-00 R/I	30-11-01
(8) Main control relay	-	13-123	H1850	LH ice relay box	30-00-00 R/I	30-11-01
Control Selection Equipment (Alternative)						
(9) Circuit breaker 28 V	-	15-216	2H1836	Map ref.E14	24-50-00 R/I	30-11-01
(10) Circuit breaker 28 V	-	15-216	2H1826	Map ref.E15	24-50-00 R/I	30-11-01
(11) Circuit breaker 28 V	-	15-216	2H1828	Map ref.F19	24-50-00 R/I	30-11-01
(12) Circuit breaker 28 V	-	15-216	2H1834	Map ref.F17	24-50-00 R/I	30-11-01
(13) Circuit breaker 28 V	-	15-215	1H1828	Map ref.F13	24-50-00 R/I	30-11-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(14) Circuit breaker 28 V	-	15-215	1H1834	Map ref.F11	24-50-00 R/I	30-11-01
(15) ALTERN selector switch	-	4-211	H1838	Flt. compt. roof panel	30-00-00 R/I	30-11-01
(16) Alternat-ive control relay	-	16-123	H1851	RH ice relay box	30-00-00 R/I	30-11-01
(17) TEMP O/RIDE switch	-	4-211	H1873	Flt.compt. roof panel	30-00-00 R/I	30-11-01
(18) Temp. override relay	-	16-123	H1852	RH ice relay box	30-00-00 R/I	30-11-01
Test Selection Equipment						
(19) TEST selector switch	-	4-211	H1872	Flt. compt. roof panel	30-00-00 R/I	30-12-01
(20) Retest time delay relay	-	13-123	1H1875	LH ice relay box	30-00-00 R/I	30-12-01
(21) Continuous time delay test relay	-	13-123	1H1853	LH ice relay box	30-00-00 R/I	30-12-01
(22) Continuous override test time delay relay	-	13-123	1H1876	LH ice relay box	30-00-00 R/I	30-12-01
(23) Retest time delay relay	-	16-123	2H1875	RH ice relay box	30-00-00 R/I	30-12-03
(24) Continuous time delay test relay	-	16-123	2H1853	RH ice relay box	30-00-00 R/I	30-12-03

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(25) Continuous override test time delay relay	-	16-123	2H1876	RH ice relay box	30-00-00 R/I	30-12-03
Indication Equipment						
(26) INT 1&2 caption light module	-	4-211	1H1517	Flt. compt. roof panel	30-00-00 R/I	30-12-01
(27) INT 3&4 caption light module	-	4-211	2H1517	Flt. compt. roof panel	30-00-00 R/I	30-12-03
(28) CYCLIC caption light module	-	4-211	1H1519	Flt. compt. roof panel	30-00-00 R/I	30-11-02
(29) CYCLIC caption light module	-	4-211	2H1519	Flt. compt. roof panel	30-00-00 R/I	30-11-03
(30) Diagnostic panel	-	8-214	H1515	3CM station	30-11-14 R/I	30-12-01
Left-hand Miscellaneous Equipment						
(31) Circuit breaker 28 V	-	3-213	1H1835	Map ref.B11	24-50-00 R/I	30-11-02
(32) Circuit breaker 28 V	-	15-216	H1511	Map ref.B15	24-50-00 R/I	30-12-01
(33) Circuit breaker 28 V	-	15-216	H1513	Map ref.B14	24-50-00 R/I	30-11-02
(34) Cyclic timer & protection unit (CTPU)	811	131	1H1839	Underfloor baggage compt.	30-11-11 R/I	30-11-02
(35) Three-phase current transformer	-	24-215	1H1840	LH flt. compt. racking	30-11-15 R/I	30-11-02

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(36) Earth current transformer	221 AA	125	1H1841	Below cabin floor	30-11-16 R/I	30-11-02
(37) Three-phase contactor	-	24-215	1H1843	LH flt. compt. racking	30-11-00 R/I	30-11-02
(38) Cyclic isolation locking relay	-	13-123	1H1878	LH ice relay box	30-00-00 R/I	30-11-02
(39) Cyclic starter relay	-	13-123	1H1877	LH ice relay box	30-00-00 R/I	30-11-02
Right-hand Miscellaneous Equipment						
(40) Circuit breaker 28 V	-	15-216	2H1835	Map ref.D14	24-50-00 R/I	30-11-03
(41) Circuit breaker 28 V	-	15-215	H1512	Map ref.B11	24-50-00 R/I	30-12-03
(42) Circuit breaker 28 V	-	15-215	H1514	Map ref.B12	24-50-00 R/I	30-11-03
(43) Cyclic timer & protection unit (CTPU)	811	132	2H1839	Underfloor baggage compt.	30-11-11 R/I	30-11-03
(44) Three-phase current transformer	-	24-216	2H1840	RH flt. compt. racking	30-11-15 R/I	30-11-03
(45) Earth current transformer	222 AA	126	2H1841	Below cabin floor	30-11-16 R/I	30-11-03
(46) Three-phase contactor	-	24-216	2H1843	RH flt. compt. racking	30-11-00 R/I	30-11-03
(47) Cyclic	-	16-123	2H1878	RH ice	30-00-00	30-11-03

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
isolation locking relay				relay box	R/I	
(48) Cyclic starter relay	-	16-123	2H1877	RH ice relay box	30-00-00 R/I	30-11-03
Associated Equipment						
(49) Weight switch relay	-	2-123	G302	LH hydraulic relay box	32-**-00 R/I	32-61-06
(50) ADC slave relay	-	13-123	1H9	LH ice relay box	30-00-00 R/I	30-31-01
(51) Weight switch relay	-	3-123	G312	RH hydraulic relay box	32-**-00 R/I	32-61-06
(52) ADC slave relay	-	16-123	2H9	RH ice relay box	30-00-00 R/I	30-31-02

Component Location - General Equipment
Table 101

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
LH Pulse 00 (Switches P2/N2)						
Switch unit	-	421	2H1651	Intake 2, above ramps	30-11-12 R/I	30-21-07
Mineral-insulated (MI) cable	-	-	2H1653	Intake 2, top lip	54-21-17 R/I	30-21-07
MI cable	-	421	2H1658	Intake 2, bottom lip	54-21-18 R/I	30-21-07
Ballast resistor	-	421	2H1660	Intake 2, rear ramp	71-63-12 R/I	30-21-07
LH Pulse 01 (Switches P2/N2)						
As pulse 00	-	-	-	-	-	-
LH Pulse 02 (Switches P2/N2)						
As pulse 00	-	-	-	-	-	-
LH Pulse 03 (Switches P2/N2)						
As pulse 00	-	-	-	-	-	-
LH Pulse 04 (Switches P4/N2)						
Switch unit	-	421	2H1651	Intake 2, above ramps	30-11-12 R/I	30-21-07
MI cable	-	421	2H1653	Intake 2, top lip	54-21-17 R/I	30-21-07
MI cable	-	421	2H1658	Intake 2, bottom lip	54-21-18 R/I	30-21-07
Change-over relay	811	1-131	1H2035	LH de-icing panel	30-00-00 R/I	30-11-02

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
Single-phase current transformer	811	2-131	1H2038	LH de-icing contactor panel	30-11-22 R/I	30-11-02
LH Pulse 05 (Switches P2/N1)						
Switch unit	-	421	2H1651	Intake 2, above ramps	30-11-12 R/I	30-21-07
MI cable	-	411/ 421	1H1652	Left intakes, centre wall	54-21-16 R/I	30-21-06
MI cable	-	411	1H1655	Intake 1, sidewall	54-21-15 R/I	30-21-06
MI cable	-	421	2H1655	Intake 2, sidewall	54-21-15 R/I	30-21-07
LH Pulse 06 (Switches P3/N2)						
Switch unit	-	421	2H1651	Intake 2, above ramps	30-11-12 R/I	30-21-07
MI cable	-	421	2H1660	Intake 2, rear ramp	71-63-12 R/I	30-21-07
MI cable	-	421	2H1661	Intake 2, air conditioning intake	54-11-11 R/I	30-21-07
LH Pulse 07 (Switches P2/N4)						
Switch unit	-	411	1H1651	Intake 1, above ramps	30-11-12 R/I	30-21-06
MI cable	-	411	1H1653	Intake 1, top lip	54-21-17 R/I	30-21-06
MI cable	-	411	1H1658	Intake 1, bottom lip	54-21-18 R/I	30-21-06

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
Ballast resistor	-	411	1H1660	Intake 1, rear ramp	71-63-12 R/I	30-21-06
LH Pulse 08 (Switches P2/N4)						
As pulse 07	-	-	-	-	-	-
LH Pulse 09 (Switches P2/N4)						
As pulse 07	-	-	-	-	-	-
LH Pulse 10 (Switches P2/N4)						
As pulse 07	-	-	-	-	-	-
LH Pulse 11 (Switches P4/N4)						
Switch unit	-	411	1H1651	Intake 1, above ramps	30-11-12 R/I	30-21-06
MI cable	-	411	1H1653	Intake 1, top lip	54-21-17 R/I	30-21-06
MI cable	-	411	1H1658	Intake 1, bottom lip	54-21-18 R/I	30-21-06
Change-over relay	811	1-131	1H2035	LH de-icing panel	30-00-00 R/I	30-11-02
Single-phase current transformer	811	2-131	1H2038	LH de-icing contactor panel	30-11-22 R/I	30-11-02
LH Pulse 12 (Switches P2/N3)						
Warning inhibition relay	811	1-131	1H2031	LH de-icing panel	30-00-00 R/I	30-11-02

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
LH Pulse 13 (Switches P3/N4)						
Switch unit	-	411	1H1651	Intake 1, above ramps	30-11-12 R/I	30-21-06
MI cable	-	411	1H1660	Intake 1, rear ramp	71-63-12 R/I	30-21-06
MI cable	-	411	1H1661	Intake 1, air conditioning intake	54-11-11 R/I	30-21-06
LH Pulse 14 (Switches P4/N1)						
Contactor	811	2-131	1H276	LH de-icing contactor panel	30-11-00 R/I	30-12-06
MI cable	-	3-513	1H290	LH wing, section 14.1	57-21-00 R/I	30-12-06
MI cable	-	4-513	1H292	LH wing, section 14.2	57-21-00 R/I	30-12-06
LH Pulse 15 (Switches P4/N3)						
Contactor	811	2-131	1H277	LH de-icing contactor panel	30-11-00 R/I	30-12-06
De-icing mat	-	3-513	1H289	LH wing, section 14.1	57-21-00 R/I	30-12-06
De-icing mat	-	4-513	1H291	LH wing, section 14.2	57-21-00 R/I	30-12-06
LH Pulse 16 (Switches P3/N3)						

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
Contactor	811	3-131	1H279	LH de-icing contactor panel	30-11-00 R/I	30-12-06
MI cable	-	5-513	1H294	LH wing, section 15.1	57-21-00 R/I	30-12-06
MI cable	-	6-513	1H296	LH wing, section 15.2	57-21-00 R/I	30-12-06
LH Pulse 17 (Switches P3/N6)						
Contactor	811	3-131	1H280	LH de-icing contactor panel	30-11-00 R/I	30-12-06
De-icing mat	-	5-513	1H293	LH wing, section 15.1	57-21-00 R/I	30-12-06
De-icing mat	-	6-513	1H295	LH wing, section 15.2	57-21-00 R/I	30-12-06
LH Pulse 18 (Switches P1/N5)						
Contactor	811	3-131	1H282	LH de-icing contactor panel	30-11-00 R/I	30-12-06
MI cable	-	7-513	1H298	LH wing, section 15.3	57-21-00 R/I	30-12-06
MI cable	-	8-513	1H300	LH wing, section 15.4	57-21-00 R/I	30-12-06
LH Pulse 19 (Switches P1/N6)						

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PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
Contactor	811	3-131	1H283	LH de-icing contactor panel	30-11-00 R/I	30-12-06
De-icing mat	-	7-513	1H297	LH wing, section 15.3	57-21-00 R/I	30-12-06
De-icing mat	-	8-513	1H299	LH wing, section 15.4	57-21-00 R/I	30-12-06
LH Pulse 20 (Switches inhibited)						
Blank pulse	-	-	-	-	-	-
LH Pulse 21 (Switches P1/N2)						
Switch unit	-	421	2H1651	Intake 2, above ramps	30-11-12 R/I	30-21-07
De-icing mat	-	421	2H1662	Intake 2, 'D' box	71-64-12 R/I	30-21-07
LH Pulse 22 (Switches P1/N4)						
Switch unit	-	411	1H1651	Intake 1, above ramps	30-11-12 R/I	30-21-06
De-icing mat	-	411	1H1662	Intake 1, 'D' box	71-64-12 R/I	30-21-06
LH Pulse 23 (Switches P3/N1)						
Contactor	811	3-131	1H306	LH de-icing contactor panel	30-11-00 R/I	30-12-05
MI cable	-	1-512	1H319	LH wing, section 13.1	57-21-00 R/I	30-12-05

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
LH Pulse 24 (Switches P3/N3)						
Contactor	811	3-131	1H305	LH de-icing contactor panel	30-11-00 R/I	30-12-05
De-icing mat	-	1-511	1H318	LH wing, fairing	57-21-00 R/I	30-12-05
De-icing mat	-	1-512	1H320	LH wing, section 13.1	57-21-00 R/I	30-12-05
LH Pulse 25 (Switches P1/N1)						
Contactor	811	2-131	1H303	LH de-icing contactor panel	30-11-00 R/I	30-12-05
MI cable	-	2-512	1H315	LH wing, section 13.2	57-21-00 R/I	30-12-05
MI cable	-	3-512	1H317	LH wing, section 13.3	57-21-00 R/I	30-12-05
LH Pulse 26 (Switches P1/N3)						
Contactor	811	3-131	1H304	LH de-icing contactor panel	30-11-00 R/I	30-12-05
De-icing mat	-	2-512	1H314	LH wing, section 13.2	57-12-00 R/I	30-12-05
De-icing mat	-	3-512	1H316	LH wing, section 13.3	57-12-00 R/I	30-12-05

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PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
LH Pulse 27 (Switches P2/N6)						
Contactor	811	2-131	1H301	LH de-icing contactor panel	30-11-00 R/I	30-12-05
MI cable	-	4-512	1H311	LH wing, section 13.4	57-21-00 R/I	30-12-05
MI cable	-	5-512	1H313	LH wing, section 13.5	57-21-00 R/I	30-12-05
LH Pulse 28 (Switches P2/N7)						
Contactor	811	2-131	1H302	LH de-icing contactor panel	30-11-00 R/I	30-12-05
De-icing mat	-	4-512	1H310	LH wing, section 13.4	57-21-00 R/I	30-12-05
De-icing mat	-	5-512	1H312	LH wing, section 13.5	57-21-00 R/I	30-12-05
LH Pulse 29 (Switches P4/N6)						
Contactor	811	2-131	1H273	LH de-icing contactor panel	30-11-00 R/I	30-12-05
MI cable	-	1-513	1H286	LH wing, section 13.6	57-21-00 R/I	30-12-05
MI cable	-	2-513	1H288	LH wing, section 13.7	57-21-00 R/I	30-12-05

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
LH Pulse 30 (Switches P4/N7)						
Contactor	811	2-131	1H274	LH de-icing contactor panel	30-11-00 R/I	30-12-05
De-icing mat	-	1-513	1H285	LH wing, section 13.6	57-21-00 R/I	30-12-05
De-icing mat	-	2-513	1H287	LH wing, section 13.7	57-21-00 R/I	30-12-05
LH Pulse 31 (Switches P4/N1)						
As pulse 14	-	-	-	-	-	-
LH Pulse 32 (Switches P4/N5)						
Contactor	811	2-131	1H278	LH de-icing contactor panel	30-11-00 R/I	30-12-06
De-icing mat	-	3-513	1H289	LH wing, section 14.1	57-21-00 R/I	30-12-06
De-icing mat	-	4-513	1H291	LH wing, section 14.2	57-21-00 R/I	30-12-06
LH Pulse 33 (Switches P3/N3)						
As pulse 16	-	-	-	-	-	-
LH Pulse 34 (Switches P3/N7)						
Contactor	811	3-131	1H281	LH de-icing contactor panel	30-11-00 R/I	30-12-06

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
De-icing mat	-	5-513	1H293	LH wing, section 15.1	57-21-00 R/I	30-12-06
De-icing mat	-	6-513	1H295	LH wing, section 15.2	57-21-00 R/I	30-12-06
LH Pulse 35 (Switches P1/N5)						
As pulse 18	-	-	-	-	-	-
LH Pulse 36 (Switches P1/N7)						
Contactor	811	3-131	1H284	LH de-icing contactor panel	30-11-00 R/I	30-12-06
De-icing mat	-	7-513	1H297	LH wing, section 15.3	57-21-00 R/I	30-12-06
De-icing mat	-	8-513	1H299	LH wing, section 15.4	57-21-00 R/I	30-12-06
LH Pulse 37 (Switches inhibited)						
Blank pulse	-	-	-	-	-	-

Component Identification - Left-hand Cyclic Loads
Table 102

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
RH Pulse 00 (Switches P2/N2)						
Switch unit	-	431	3H1651	Intake 3, above ramps	30-11-12 R/I	30-21-08
Mineral-insulated (MI) cable	-	431	3H1653	Intake 3, top lip	54-21-17 R/I	30-21-08
MI cable	-	431	3H1658	Intake 3, bottom lip	54-21-18 R/I	30-21-08
Ballast resistor	-	431	3H1660	Intake 3, rear ramp	71-63-12 R/I	30-21-08
RH Pulse 01 (Switches P2/N2)						
As pulse 00	-	-	-	-	-	-
RH Pulse 02 (Switches P2/N2)						
As pulse 00	-	-	-	-	-	-
RH Pulse 03 (Switches P2/N2)						
As pulse 00	-	-	-	-	-	-
RH Pulse 04 (Switches P4/N2)						
Switch unit	-	431	3H1651	Intake 3, above ramps	30-11-12 R/I	30-21-08
MI cable	-	431	3H1653	Intake 3, top lip	54-21-17 R/I	30-21-08
MI cable	-	431	3H1658	Intake 3, bottom lip	54-21-18 R/I	30-21-08
Change-over relay	811	1-132	2H2035	RH de-icing panel	30-00-00 R/I	30-11-03

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
Single-phase current transformer	811	2-132	2H2038	RH de-icing contactor panel	30-11-22 R/I	30-11-03
RH Pulse 05 (Switches P2/N1)						
Switch unit	-	431	3H1651	Intake 3, above ramps	30-11-12 R/I	30-21-08
MI cable	-	431/ 441	4H1652	Right intakes, centre wall	54-21-16 R/I	30-21-09
MI cable	-	441	4H1655	Intake 4, sidewall	54-21-15 R/I	30-21-09
MI cable	-	431	3H1655	Intake 3, sidewall	54-21-15 R/I	30-21-08
RH Pulse 06 (Switches P3/N2)						
Switch unit	-	431	3H1651	Intake 3, above ramps	30-11-12 R/I	30-21-08
MI cable	-	431	3H1660	Intake 3, rear ramp	71-63-12 R/I	30-21-08
MI cable	-	431	3H1661	Intake 3, air cond- itioning intake	54-11-11 R/I	30-21-08
RH Pulse 07 (Switches P2/N4)						
Switch unit	-	441	4H1651	Intake 4, above ramps	30-11-12 R/I	30-21-09
MI cable	-	441	4H1653	Intake 4, top lip	54-21-17 R/I	30-21-09
MI cable	-	441	4H1658	Intake 4, bottom lip	54-21-18 R/I	30-21-09

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
Ballast resistor	-	441	4H1660	Intake 4, rear ramp	71-63-12 R/I	30-21-09
RH Pulse 08 (Switches P2/N4)						
As pulse 07	-	-	-	-	-	-
RH Pulse 09 (Switches P2/N4)						
As pulse 07	-	-	-	-	-	-
RH Pulse 10 (Switches P2/N4)						
As pulse 07	-	-	-	-	-	-
RH Pulse 11 (Switches P4/N4)						
Switch unit	-	441	4H1651	Intake 4, above ramps	30-11-12 R/I	30-21-09
MI cable	-	441	4H1653	Intake 4, top lip	54-21-17 R/I	30-21-09
MI cable	-	441	4H1658	Intake 4, bottom lip	54-21-18 R/I	30-21-09
Change-over relay	811	1-132	2H2035	RH de-icing panel	30-00-00 R/I	30-11-03
Single-phase current transformer	811	2-132	2H2038	RH de-icing contactor panel	30-11-22 R/I	30-11-03
RH Pulse 012 (Switches P2/N3)						
Warning inhibition relay	811	1-132	2H2031	RH de-icing panel	30-00-00 R/I	30-11-03

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
RH Pulse 13 (Switches P3/N4)						
Switch unit	-	441	4H1651	Intake 4, above ramps	30-11-12 R/I	30-21-09
MI cable	-	441	4H1660	Intake 4, rear ramp	71-63-12 R/I	30-21-09
MI cable	-	441	4H1661	Intake 4, air cond-itioning intake	54-11-11 R/I	30-21-09
RH Pulse 14 (Switches P4/N1)						
Contactor	811	2-132	2H276	RH de-icing contactor panel	30-11-00 R/I	30-12-08
MI cable	-	3-613	2H290	RH wing, section 14.1	57-21-00 R/I	30-12-08
MI cable	-	4-613	2H292	RH wing, section 14.2	57-21-00 R/I	30-12-08
RH Pulse 15 (Switches P4/N3)						
Contactor	811	2-132	2H277	RH de-icing contactor panel	30-11-00 R/I	30-12-08
De-icing mat	-	3-613	2H289	RH wing, section 14.1	57-21-00 R/I	30-12-08
De-icing mat	-	4-613	2H291	RH wing, section 14.2	57-21-00 R/I	30-12-08

RH Pulse 16 (Switches P3/N3)

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
Contactor	811	3-132	2H279	RH de-icing contactor panel	30-11-00 R/I	30-12-08
MI cable	-	5-613	2H294	RH wing, section 15.1	57-21-00 R/I	30-12-08
MI cable	-	6-613	2H296	RH wing, section 15.2	57-21-00 R/I	30-12-08
RH Pulse 17 (Switches P3/N6)						
Contactor	811	3-132	2H280	RH de-icing contactor panel	30-11-00 R/I	30-12-08
De-icing mat	-	5-613	2H293	RH wing, section 15.1	57-21-00 R/I	30-12-08
De-icing mat	-	6-613	2H295	RH wing, section 15.2	57-21-00 R/I	30-12-08
RH Pulse 18 (Switches P1/N5)						
Contactor	811	3-132	2H282	RH de-icing contactor panel	30-11-00 R/I	30-12-08
MI cable	-	7-613	2H298	RH wing, section 15.3	57-21-00 R/I	30-12-08
MI cable	-	8-613	2H300	RH wing, section 15.4	57-21-00 R/I	30-12-08
RH Pulse 19 (Switches P1/N6)						

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
Contactor	811	3-132	2H283	RH de-icing contactor panel	30-11-00 R/I	30-12-08
De-icing mat	-	7-613	2H297	RH wing, section 15.3	57-21-00 R/I	30-12-08
De-icing mat	-	8-613	2H299	RH wing, section 15.4	57-21-00 R/I	30-12-08
RH Pulse 20 (Switches inhibited)						
Blank pulse	-	-	-	-	-	-
RH Pulse 21 (Switches P1/N2)						
Switch unit	-	431	3H1651	Intake 3, above ramps	30-11-12 R/I	30-21-08
De-icing mat	-	431	3H1662	Intake 3, 'D' box	71-64-12 R/I	30-21-08
RH Pulse 22 (Switches P1/N4)						
Switch unit	-	441	4H1651	Intake 4, above ramps	30-11-12 R/I	30-21-09
De-icing mat	-	441	4H1662	Intake 4, 'D' box	71-64-12 R/I	30-21-09
RH Pulse 23 (Switches P3/N1)						
Contactor	811	3-132	2H306	RH de-icing contactor panel	30-11-00 R/I	30-12-07
MI cable	-	1-612	2H319	RH wing, section 13.1	57-21-00 R/I	30-12-07

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
RH Pulse 24 (Switches P3/N3)						
Contactor	811	3-132	2H305	RH de-icing contactor panel	30-11-00 R/I	30-12-07
De-icing mat	-	1-611	2H318	RH wing, fairing	57-21-00 R/I	30-12-07
De-icing mat	-	1-612	2H320	RH wing, section 13.1	57-21-00 R/I	30-12-07
RH Pulse 25 (Switches P1/N1)						
Contactor	811	2-132	2H303	RH de-icing contactor panel	30-11-00 R/I	30-12-07
MI cable	-	2-612	2H315	RH wing, section 13.2	57-21-00 R/I	30-12-07
MI cable	-	3-612	2H317	RH wing, section 13.3	57-21-00 R/I	30-12-07
RH Pulse 26 (Switches P1/N3)						
Contactor	811	3-132	2H304	RH de-icing contactor panel	30-11-00 R/I	30-12-07
De-icing mat	-	2-612	2H314	RH wing, section 13.2	57-21-00 R/I	30-12-07
De-icing mat	-	3-612	2H316	RH wing, section 13.3	57-21-00 R/I	30-12-07

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
RH Pulse 27 (Switches P2/N6)						
Contactor	811	2-132	2H301	RH de-icing contactor panel	30-11-00 R/I	30-12-07
MI cable	-	4-612	2H311	RH wing, section 13.4	57-21-00 R/I	30-12-07
MI cable	-	5-612	2H313	RH wing, section 13.5	57-21-00 R/I	30-12-07
RH Pulse 28 (Switches P2/N7)						
Contactor	811	2-132	2H302	RH de-icing contactor panel	30-11-00 R/I	30-12-07
De-icing mat	-	4-612	2H310	RH wing, section 13.4	57-21-00 R/I	30-12-07
De-icing mat	-	5-612	2H312	RH wing, section 13.5	57-21-00 R/I	30-12-07
RH Pulse 29 (Switches P4/N6)						
Contactor	811	2-132	2H273	RH de-icing contactor panel	30-11-00 R/I	30-12-07
MI cable	-	1-613	2H286	RH wing, section 13.6	57-21-00 R/I	30-12-07
MI cable	-	2-613	2H288	RH wing, section 13.7	57-21-00 R/I	30-12-07

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
RH Pulse 30 (Switches P4/N7)						
Contactor	811	2-132	2H274	RH de-icing contactor panel	30-11-00 R/I	30-12-07
De-icing mat	-	1-613	2H285	RH wing, section 13.6	57-21-00 R/I	30-12-07
De-icing mat	-	2-613	2H287	RH wing, section 13.7	57-21-00 R/I	30-12-07
RH Pulse 31 (Switches P4/N1)						
As pulse 14	-	-	-	-	-	-
RH Pulse 32 (Switches P4/N5)						
Contactor	811	2-132	2H278	RH de-icing contactor panel	30-11-00 R/I	30-12-08
De-icing mat	-	3-613	2H289	RH wing, section 14.1	57-21-00 R/I	30-12-08
De-icing mat	-	4-613	2H291	RH wing, section 14.2	57-21-00 R/I	30-12-08
RH Pulse 33 (Switches P3/N3)						
As pulse 16	-	-	-	-	-	-
RH Pulse 34 (Switches P3/N7)						
Contactor	811	3-132	2H281	RH de-icing contactor panel	30-11-00 R/I	30-12-08

PULSE NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
De-icing mat	-	5-613	2H293	RH wing, section 15.1	57-21-00 R/I	30-12-08
De-icing mat	-	6-613	2H295	RH wing, section 15.2	57-21-00 R/I	30-12-08
RH Pulse 35 (Switches P1/N5)						
As pulse 18	-	-	-	-	-	-
RH Pulse 36 (Switches P1/N7)						
Contactor	811	3-132	2H284	RH de-icing contactor panel	30-11-00 R/I	30-12-08
De-icing mat	-	7-613	2H297	RH wing, section 15.3	57-21-00 R/I	30-12-08
De-icing mat	-	8-613	2H299	RH wing, section 15.4	57-21-00 R/I	30-12-08
RH Pulse 37 (Switches inhibited)						
Blank pulse	-	-	-	-	-	-

Component Identification - Right-hand Cyclic Loads
Table 103

CAPTION NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
LH Caption 1						
Circuit breaker	-	14-215	1H403	Map ref.C8	24-50-00 R/I	30-12-01
Control relay	-	13-123	1H1859	LH ice relay box	30-00-00 R/I	30-12-01
Current sensor	811	1-131	1H407	LH de-icing panel	30-00-00 R/I	30-12-01
Mineral-insulated (MI) cable	-	511	1H402	LH wing, fairing	57-21-00 R/I	30-12-01
MI cable	-	1-512	1H411	LH wing, section 13.1	57-21-00 R/I	30-12-01
LH Caption 2						
Circuit breaker	-	14-215	1H406	Map ref.D8	24-50-00 R/I	30-12-01
Control relay	-	13-123	1H2039	LH ice relay box	30-00-00 R/I	30-12-01
Current sensor	811	1-131	1H410	LH de-icing panel	30-00-00 R/I	30-12-01
MI cable	-	2-512	1H299	LH wing, section 13.2	57-21-00 R/I	30-12-01
MI cable	-	3-512	1H400	LH wing, section 13.3	57-21-00 R/I	30-12-01
MI cable	-	4-512	1H401	LH wing, section 13.4	57-21-00 R/I	30-12-01

CAPTION NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
LH Caption 3						
Circuit breaker	-	14-215	1H371	Map ref. D6	24-50-00 R/I	30-12-01
Control relay	-	13-123	1H1858	LH ice relay box	30-00-00 R/I	30-12-01
Current sensor	811	1-131	1H380	LH de-icing panel	30-00-00 R/I	30-12-01
MI cable	-	5-512	1H412	LH wing, section 13.5	57-21-00 R/I	30-12-01
MI cable	-	1-513	1H390	LH wing, section 13.6	57-21-00 R/I	30-12-01
LH Caption 4						
Circuit breaker	-	14-215	1H372	Map ref.C6	24-50-00 R/I	30-12-01
Control relay	-	13-123	1H1858	LH ice relay box	30-00-00 R/I	30-12-01
Current sensor	811	1-131	1H381	LH de-icing panel	30-00-00 R/I	30-12-01
MI cable	-	2-513	1H391	LH wing, section 13.7	57-21-00 R/I	30-12-01
MI cable	-	7-513	1H396	LH wing, section 15.3	57-21-00 R/I	30-12-01
LH Caption 5						
Circuit breaker	-	14-215	1H373	Map ref.C7	24-50-00 R/I	30-12-01

CAPTION NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
Control relay	-	13-123	1H1859	LH ice relay box	30-00-00 R/I	30-12-01
Current sensor	811	1-132	1H382	LH de-icing panel	30-00-00 R/I	30-12-01
MI cable	-	3-513	1H392	LH wing, section 14.1	57-21-00 R/I	30-12-01
MI cable	-	4-513	1H393	LH wing, section 14.2	57-21-00 R/I	30-12-01
LH Caption 6						
Circuit breaker	-	14-215	1H374	Map ref.D7	24-50-00 R/I	30-12-01
Control relay	-	13-123	1H1859	LH ice relay box	30-00-00 R/I	30-12-01
Current sensor	811	1-131	1H383	LH de-icing panel	30-00-00 R/I	30-12-01
MI cable	-	5-513	1H394	LH wing, section 15.1	57-21-00 R/I	30-12-01
MI cable	-	6-513	1H395	LH wing, section 15.2	57-21-00 R/I	30-12-01
LH Caption 7						
Circuit breaker	-	14-215	1H1415	Map ref.B6	24-50-00 R/I	30-21-01
Control relay	-	13-123	1H2039	LH ice relay box	30-00-00 R/I	30-12-01
Current sensor	811	1-131	1H1421	LH de-icing panel	30-00-00 R/I	30-21-01

CAPTION NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
MI cable	-	411	1H1660	Intake 1, rear ramp	71-63-12 R/I	30-21-06
LH Caption 8						
Circuit breaker	-	13-215	2H1415	Map ref.A10	24-50-00 R/I	30-21-01
Control relay	-	13-123	1H1858	LH ice relay box	30-00-00 R/I	30-12-01
Current sensor	811	1-131	2H1421	LH de-icing panel	30-00-00 R/I	30-21-01
MI cable	-	421	2H1660	Intake 2, rear ramp	71-63-12 R/I	30-21-07
LH Caption 9						
Circuit breaker	-	14-215	1H1411	Map ref.B7	24-50-00 R/I	30-21-01
Control relay	811	1-131	1H1846	LH de-icing panel	30-00-00 R/I	30-21-01
Control micro-switch	-	411	1H1861	Intake 1, spill door	71-64-12 R/I	30-21-01
Indication relay	811	1-131	1H1854	LH de-icing panel	30-00-00 R/I	30-21-01
Indication microswitch	-	411	1H1860	Intake 1, spill door	71-64-12 R/I	30-21-01
Current sensor	811	1-131	1H1420	LH de-icing panel	30-00-00 R/I	30-21-01
De-icing mat	-	411	1H1662	Intake 1, 'D' box	71-64-11 R/I	30-21-06
LH Caption 10						

CAPTION NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
Circuit breaker	-	13-215	2H1411	Map ref.A9	24-50-00 R/I	30-21-01
~~Control relay~~	~~811~~	~~1-131~~	~~1H1847~~	~~LH de-icing~~ panel	~~30-00-00~~ R/I	~~30-21-01~~
Control micro-switch	-	421	1H1863	Intake 2, spill door	71-64-12 R/I	30-21-01
Indication relay	811	1-131	1H1855	LH de-icing panel	30-00-00 R/I	30-21-01
Indication microswitch	-	421	1H1862	Intake 2, spill door	71-64-12 R/I	30-21-01
Current sensor	811	1-131	2H1420	LH de-icing panel	30-00-00 R/I	30-21-01
De-icing mat	-	421	2H1662	Intake 2, 'D' box	71-64-12 R/I	30-21-07

Component Identification - Left-hand Continuous Loads
Table 104

CAPTION NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
RH Caption 1						
Circuit breaker	-	14-216	2H403	Map ref.B15	24-50-00 R/I	30-12-03
Control relay	-	16-123	2H1859	RH ice relay box	30-00-00 R/I	30-12-03
Current sensor	811	1-132	2H407	RH de-icing panel	30-00-00 R/I	30-12-03
Mineral-insulated (MI) cable	-	611	2H402	RH wing, fairing	57-21-00 R/I	30-12-03
MI cable	-	1-612	2H411	RH wing, section 13.1	57-21-00 R/I	30-12-03
RH Caption 2						
Circuit breaker	-	14-216	2H406	Map ref.C15	24-50-00 R/I	30-12-03
Control relay	-	16-123	2H2039	RH ice relay box	30-00-00 R/I	30-12-03
Current sensor	811	1-132	2H410	RH de-icing panel	30-00-00 R/I	30-12-03
MI cable	-	2-612	2H399	RH wing, section 13.2	57-21-00 R/I	30-12-03
MI cable	-	3-612	2H400	RH wing, section 13.3	57-21-00 R/I	30-12-03
MI cable	-	4-612	2H401	RH wing, section 13.4	57-21-00 R/I	30-12-03

RH Caption 3

CAPTION NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
Circuit breaker	-	14-216	2H371	Map ref.C12	24-50-00 R/I	30-12-03
Control relay	-	16-123	2H1858	RH ice relay box	30-00-00 R/I	30-12-03
Current sensor	811	1-132	2H380	RH de-icing panel	30-00-00 R/I	30-12-03
MI cable	-	5-612	2H412	RH wing, section 13.5	57-21-00 R/I	30-12-03
MI cable	-	1-613	2H390	RH wing, section 13.6	57-21-00 R/I	30-12-03
RH Caption 4						
Circuit breaker	-	14-216	2H372	Map ref.B12	24-50-00 R/I	30-12-03
Control relay	-	16-123	2H1858	RH ice relay box	30-00-00 R/I	30-12-03
Current sensor	811	1-132	2H381	RH de-icing panel	30-00-00 R/I	30-12-03
MI cable	-	2-613	2H391	RH wing, section 13.7	57-21-00 R/I	30-12-03
MI cable	-	7-613	2H396	RH wing, section 15.3	57-21-00 R/I	30-12-03
RH Caption 5						
Circuit breaker	-	14-216	2H373	Map ref.B13	24-50-00 R/I	30-12-03
Control relay	-	16-123	2H1859	RH ice relay box	30-00-00 R/I	30-12-03

CAPTION NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
Current sensor	811	1-132	2H382	RH de-icing panel	30-00-00 R/I	30-12-03
MI cable	-	3-613	2H392	RH wing, section 14.1	57-21-00 R/I	30-12-03
MI cable	-	4-613	2H393	RH wing, section 14.2	57-21-00 R/I	30-12-03
RH Caption 6						
Circuit breaker	-	14-216	2H374	Map ref.C13	24-50-00 R/I	30-12-03
Control relay	-	16-123	2H1859	RH ice relay box	30-00-00 R/I	30-12-03
Current sensor	811	1-132	2H383	RH de-icing panel	30-00-00 R/I	30-12-03
MI cable	-	5-613	2H394	RH wing, section 15.1	57-21-00 R/I	30-12-03
MI cable	-	6-613	2H395	RH wing, section 15.2	57-21-00 R/I	30-12-03
RH Caption 7						
Circuit breaker	-	14-216	4H1415	Map ref.A14	24-50-00 R/I	30-21-03
Control relay	-	16-123	2H2039	RH ice relay box	30-00-00 R/I	30-12-03
Current sensor	811	1-132	4H1421	RH de-icing panel	30-00-00 R/I	30-21-03
MI cable	-	441	4H1660	Intake 4, rear ramp	71-63-12 R/I	30-21-09

CAPTION NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
RH Caption 8						
Circuit breaker	-	13-216	3H1415	Map ref.A11	24-50-00 R/I	30-21-03
Control relay	-	16-123	2H1858	RH ice relay box	30-00-00 R/I	30-12-03
Current sensor	811	1-132	3H1421	RH de-icing panel	30-00-00 R/I	30-21-03
MI cable	-	431	3H1660	Intake 3, rear ramp	71-63-12 R/I	30-21-08
RH Caption 9						
Circuit breaker	-	14-216	4H1411	Map ref.A15	24-50-00 R/I	30-21-03
Control relay	811	1-132	2H1846	RH de-icing panel	30-00-00 R/I	30-21-03
Control micro-switch	-	441	4H1861	Intake 4, spill door	71-64-12 R/I	30-21-03
Indication relay	811	1-132	2H1854	RH de-icing panel	30-00-00 R/I	30-21-03
Indication microswitch	-	441	4H1860	Intake 4, spill door	71-64-12 R/I	30-21-03
Current sensor	811	1-132	4H1420	RH de-icing panel	30-00-00 R/I	30-21-03
De-icing mat	-	441	4H1662	Intake 4, 'D' box	71-64-12 R/I	30-21-09
RH Caption 10						
Circuit breaker	-	13-216	3H1411	Map ref.A10	24-50-00 R/I	30-21-03

CAPTION NO. AND COMPONENTS	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
Control relay	811	1-132	2H1847	RH de-icing panel	30-00-00 R/I	30-21-03
Control micro-switch	-	431	3H1863	Intake 3, spill door	71-64-12 R/I	30-21-03
Indication relay	811	1-132	2H1855	RH de-icing panel	30-00-00 R/I	30-21-03
Indication microswitch	-	431	3H1862	Intake 3, spill door	71-64-12 R/I	30-21-03
Current sensor	811	1-132	3H1420	RH de-icing panel	30-00-00 R/I	30-21-03
De-icing mat	-	431	3H1662	Intake 3, 'D' box	71-64-12 R/I	30-21-08

Component Identification - Right-hand Continuous Loads
Table 105

FAILURE INDICATED ON PULSES	REF. CHART	PROBABLE CAUSE
00,01,02 & 03	*See NOTE	
R 04	103	) Fault on individual load.
05	103	)
06	103	)
07,08,09 & 10	103	)
11	103	)
13	103	)
14 & 31	103	)
15	103	)
16 & 33	103	)
17	103	)
18 & 35	103	)
19	103	)
21	103	)
22	103	)
23	103	)
24	103	)
25	103	)
26	103	)
27	103	)
28	103	)
29	103	)
30	103	)

FAILURE INDICATED ON PULSES	REF. CHART	PROBABLE CAUSE
32	103	
34	103	
36	103	
12	*See NOTE	
04,11,14,15, 29,30,31 & 32	104	Suspected failure of positive d.c. output switch in CTPU or matrix wiring.
06,13,16,17, 23,24,33 & 34	104	
18,19,21,22, 25,26,35 & 36	104	
05,14,23,25 & 31	105	Suspected failure of negative d.c. output switch in CTPU or matrix wiring.
12,15,24 & 26	105	
16,18,32,33 & 35	105	
17,19,27 & 29	105	
28,30,34 & 36	105	
21 & 22	106	Suspect connection on CTPU output connector.
18,19,25,26, 35 & 36	106	
27 & 28	106	
14,15,29,30, 31 & 32	106	
06 & 13	106	
16,17,23,24, 33 & 34	106	
04 & 11	107	Fault on current transformer change-over pulses.

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FAILURE INDICATED ON PULSES	REF. CHART	PROBABLE CAUSE
07,08,09,10, 11,13 & 22	108	Suspect connection on CTPU or outboard intake switch unit.

*NOTE: Faults on these pulses are covered in the main trouble shooting under separate headings.

Cyclic De-icing Failure Patterns
Table 106

PULSE	WIRING DIAGRAM LEFT	RIGHT	CONTACTOR	RESISTANCE RANGE (ohm)	BETWEEN PHASES
00	30-21-07	30-21-08	G	29.6 to 36.2 30.1 to 36.7 30.0 to 36.6	A - B B - C C - A
01	As load 00		-	-	-
02	As load 00		-	-	-
03	As load 00		-	-	-
04	30-21-07	30-21-08	E	14.6 to 17.8	B - C
05	30-21-07	30-21-08	F	18.3 to 22.3 18.3 to 22.3 17.8 to 21.8	A - B B - C C - A
06	30-21-07	30-21-08	L	14.0 to 17.2 14.1 to 17.3 14.0 to 17.2	A - B B - C C - A
07	30-21-06	30-21-09	G	29.4 to 35.9 29.6 to 36.2 29.4 to 35.9	A - B B - C C - A
08	As load 07		-	-	-
09	As load 07		-	-	-
10	As load 07		-	-	-
11	30-21-06	30-21-09	E	14.6 to 17.8	B - C
12	No elements		-	-	-
13	30-21-06	30-21-09	L	14.0 to 17.2 14.1 to 17.3 14.3 to 17.5	A - B B - C C - A
14	30-12-06	30-12-08	H276	5.9 to 7.3 5.9 to 7.3 5.9 to 7.3	A - B B - C C - A
15	30-12-06	30-12-08	H277	5.1 to 6.3 5.1 to 6.3 5.1 to 6.3	A - B B - C C - A

PULSE	WIRING DIAGRAM LEFT	RIGHT	CONTACTOR	RESISTANCE RANGE (ohm)	BETWEEN PHASES
16	30-12-06	30-12-08	H279	8.0 to 9.8	A - B
				8.5 to 10.4	B - C
				8.0 to 9.8	C - A
17	30-12-06	30-12-08	H280	6.0 to 7.4	A - B
				6.0 to 7.4	B - C
				6.0 to 7.4	C - A
18	30-12-06	30-12-08	H282	7.9 to 9.7	A - B
				8.4 to 10.2	B - C
				7.9 to 9.7	C - A
19	30-12-06	30-12-08	H283	4.9 to 6.0	A - B
				4.9 to 6.0	B - C
				4.9 to 6.0	C - A
20	Blank pulse		-	-	-
21	30-21-07	30-21-08	J	5.6 to 6.8	A - B
				5.6 to 6.8	B - C
				5.6 to 6.8	C - A
22	30-21-06	30-21-09	J	5.6 to 6.8	A - B
				5.6 to 6.8	B - C
				5.6 to 6.8	C - A
23	30-12-05	30-12-07	H306	15.6 to 19.0	A - B
				16.4 to 20.0	B - C
				15.6 to 19.0	C - A
24	30-12-05	30-12-07	H305	4.4 to 5.4	A - B(LH)
				4.4 to 5.4	B - C(LH)
				4.4 to 5.4	C - A(LH)
				5.0 to 6.2	A - B(RH)
				5.0 to 6.2	B - C(RH)
				5.0 to 6.2	C - A(RH)
25	30-12-05	30-12-07	H303	7.7 to 9.5	A - B
				8.2 to 10.0	B - C
				7.7 to 9.5	C - A
26	30-12-05	30-12-07	H304	7.8 to 9.6	A - B
				7.8 to 9.6	B - C
				7.8 to 9.6	C - A
27	30-12-05	30-12-07	H301	7.7 to 9.5	A - B

PULSE	WIRING DIAGRAM LEFT	RIGHT	CONTACTOR	RESISTANCE RANGE (ohm)	BETWEEN PHASES
				8.2 to 10.0	B - C
				7.7 to 9.5	C - A
28	30-12-05	30-12-07	H302	8.6 to 10.6	A - B
				8.6 to 10.6	B - C
				8.6 to 10.6	C - A
29	30-12-05	30-12-07	H273	7.7 to 9.5	A - B
				8.2 to 10.0	B - C
				7.7 to 9.5	C - A
30	30-12-05	30-12-07	H274	6.0 to 7.4	A - B
				6.0 to 7.4	B - C
				6.0 to 7.4	C - A
31	As load 14		-	-	-
32	30-12-06	30-12-08	H278	5.1 to 6.3	A - B
				5.1 to 6.3	B - C
				5.1 to 6.3	C - A
33	As load 16		-	-	-
34	30-12-06	30-12-08	H281	6.0 to 7.4	A - B
				6.0 to 7.4	B - C
				6.0 to 7.4	C - A
35	As load 18		-	-	-
36	30-12-06	30-12-08	H284	4.9 to 6.0	A - B
				4.9 to 6.0	B - C
				4.9 to 6.0	C - A
37	Blank pulse		-	-	-

Cyclic De-icing Load Resistances
Table 107

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CAPTION	WIRING DIAGRAM LEFT	RIGHT	RESISTANCE RANGE (ohm)	BETWEEN EARTH AND *TEST SOCKET PIN
1	30-12-01	30-12-03	6.6 to 9.8	V
2	30-12-01	30-12-03	6.7 to 10.1	F
3	30-12-01	30-12-03	6.6 to 9.8	R
4	30-12-01	30-12-03	5.6 to 8.4	S
5	30-12-01	30-12-03	5.6 to 8.4	U
6	30-12-01	30-12-03	5.6 to 8.4	E
7	30-21-01	30-21-03	5.2 to 7.8	b
8	30-21-01	30-21-03	5.2 to 7.8	a
**ON A/C	001-001, 003-003,			
R After SB 54-036 01		For A/C	001-001,003-003,	
7	30-21-01	30-21-03	9.93 to 11.55	b
8	30-21-01	30-21-03	9.93 to 11.55	a
**ON A/C	ALL			
9	30-21-01	30-21-03	6.8 to 10.2	H
10	30-21-01	30-21-03	6.8 to 10.2	J

* Test socket UT1805, panel 13-123 (LH); UT1806, 16-123 (RH).

Continuous De-icing Load Resistances
Table 108

DE-ICING CONTROL AND INDICATION - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

This topic contains instructions for the removal and installation of contactors associated with the de-icing control and indication system.

Two 3-phase contactors of the same type are mounted in the flight compartment racking, one in the LH racking on panel 24-215, and one in the RH racking on panel 24-216. Contactors of a different type are mounted on the LH and RH de-icing contactor panels, 2-131, 3-131, 2-132 and 3-132, located behind the sidewall panels in the lower baggage compartment.

Instructions for the removal and installation of minor electrical components comprising switches, relays and diodes, mounted on the flight compartment roof panel, in the ice relay boxes, the air/ice contactor boxes and on the de-icing panels, are contained in 30-00-00.

Instructions for the removal and installation of microswitches associated with spill door 'D' box continuous de-icing indication and control are contained in 71-64-12.

2. Contactor on Flight Compartment Racking Panel 24-215 or 24-216 (Ref. Fig. 401)

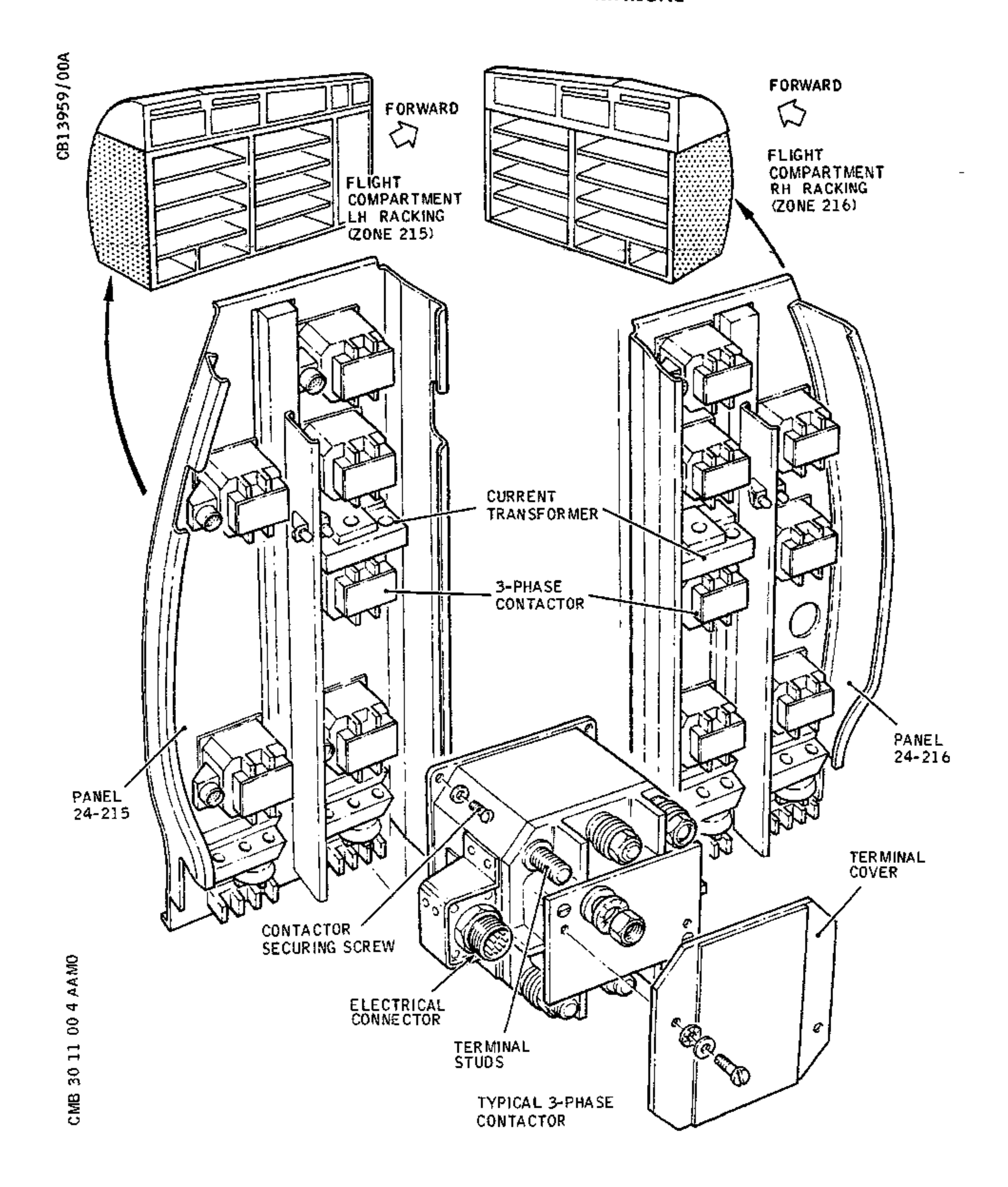
A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner, 119 to 131 lbf in (1.35 to 1.48 mdaN)	-

B. Prepare

(1) Isolate the electrical generation and external power supplies as detailed in 24-00-00, Servicing.

(2) Gain access to panel 24-215 by removing the service trolleys stowed under the galley working surface and, if necessary, dismantling the galley structure as detailed in Chapter 25. Release the quick-release fasteners securing the lower access panel to the



- Contactors on Panels 24-215 and 24-216 - Installation
Figure 401

racking and remove the panel.

(3) Gain access to panel 24-216 by removing the furnished bulkhead as detailed in 25-23-11, Removal/ Installation.

C. Remove

(1) Remove the cover from the contactor terminals.

(2) Disconnect the electrical cables/busbars from the contactor main terminal studs, noting the order of assembly of cable terminations and washers at the contactor terminals, to ensure correct installation.

(3) Release the busbars from the adjacent contactor terminal studs, and move the busbars through the associated current transformer core holes sufficiently to free the contactor to be removed.

(4) Disconnect the electrical connector on the side of the contactor.

(5) Remove the screws and washers securing the contactor to the panel and withdraw the contactor from the racking.

D. Install

(1) Comply with the electrical safety precautions.

CAUTION: CONTACTORS ARE SUPPLIED WITH ONE THICK WASHER, ONE THIN WASHER AND A SPRING WASHER TO EACH TERMINAL POST. THE SPRING WASHER MUST BE PLACED DIRECTLY UNDER THE TERMINAL NUT AND THE THIN WASHER UNDER THE SPRING WASHER. DISCARD THE THICK WASHER.

THE ASSEMBLY ORDER OF BUSBAR/CABLES TO A CONTACTOR TERMINAL POST MUST BE BUSBAR FIRST, IF APPLICABLE, FOLLOWED BY CABLES IN SIZE ORDER WITH THE LARGEST CABLE FIRST.

(2) Fit the contactor to its mounting on the panel, ensuring that the electrical connector on the contactor is facing left, and secure it with the screws and washers.

(3) Remove the terminal cover from the contactor.

(4) Pass the busbars through the current transformer

core holes and fit the busbars to the contactor terminal studs, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(5) Connect the electrical cables to the contactor terminal posts, ensuring that the order of assembly of cable terminations and washers is correct and that the connections are made in accordance with the cable identifications and the applicable wiring diagram. Torque-tighten the terminal nuts to between 119 and 131 lbf in (1.35 and 1.48 mdaN).

(6) Refit the terminal cover to the contactor.

(7) Connect the electrical connector to the contactor, ensuring that the mating surfaces are clean and undamaged.

(8) Check that the contactor is bonded in accordance with 20-27-11.

E. Conclusion

(1) For panel 24-215, fit the access panel to the racking and secure it with the quick-release fasteners, or fit the furnished bulkhead over panel 24-216 as detailed in 25-23-11, Removal/Installation, as applicable.

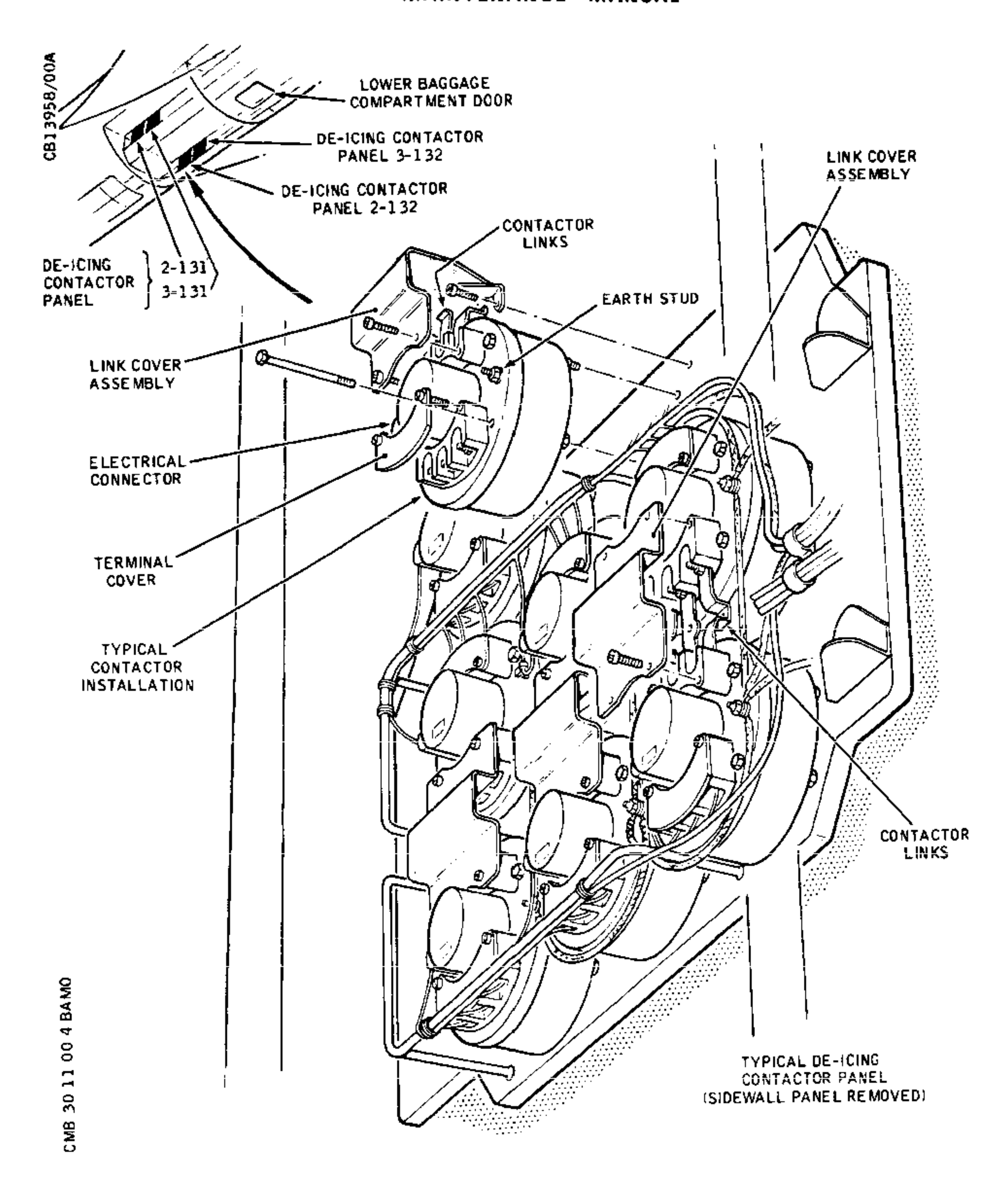
(2) Make available electrical ground power as detailed in 24-41-00, and check the operation of the contactor by carrying out the appropriate test procedure.

(3) If applicable, assemble the galley structure as detailed in Chapter 25, and stow the service trolleys under the galley working surface.

3. Contactor on LH or RH De-icing Contactor Panel
(Ref. Fig. 402)

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner, 23 to 25 lbf in (0.26 to 0.28 mdaN)	-



- Contactors on De-icing Contactor Panels - Installation
Figure 402

B. Prepare

(1) Isolate the electrical generation and external power supplies as detailed in 24-00-00, Servicing.

(2) Open the lower baggage compartment door (Ref. 52-31-21).

(3) Gain access to the LH or RH de-icing contactor panel, as applicable, by removing the appropriate sidewall panel, FS or KS (Ref. 25-52-00), in the lower baggage compartment.

C. Remove

(1) Remove the link cover assembly and the terminal cover from the contactor. Retain the link cover assembly for future installation.

(2) Disconnect the bonding lead from the earth stud on the contactor.

NOTE: At certain positions the cable loom running to adjacent contactors is secured to the earth stud by a P-clip, which must be removed and retained.

(3) Disconnect the electrical connector from the contactor.

(4) Disconnect the contactor links and the electrical cables from the contactor terminal studs. For a contactor on the centre or bottom row of the panel, assist disconnection of the links by releasing the contactor links on the associated contactor terminals.

(5) Remove the bolts securing the contactor to its mounting, and withdraw the contactor from the panel.

D. Install

(1) Comply with the electrical safety precautions.

(2) Remove both terminal covers, and discard the appropriate terminal cover from the contactor.

(3) On panels 2-131 and 3-131, fit the contactor to its mounting so that terminals L1, L2 and L3 are uppermost. On panels 2-132 and 3-132, fit the

contactor to its mounting so that terminals A, B and C are uppermost. Secure the contactor to the panel with the bolts.

(4) Connect the contactor links and electrical cables to the appropriate contactor terminal studs with the nuts and captive washers, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram. ~~Torque-tighten the terminal nuts to between 23 and~~ 25 lbf in (0.26 and 0.28 mdaN). For a contactor on the centre or bottom row of the panel, torque-tighten the associated contactor terminal nuts to between 23 and 25 lbf in (0.26 and 0.28 mdaN).

(5) Connect the electrical connector to the contactor, ensuring that the mating surfaces are clean and undamaged.

(6) Connect the bonding lead to the earth stud on the contactor and secure it with the nut.

NOTE: Where applicable, secure the cable loom running to the adjacent contactor, to the earth stud, with the P-clip.

(7) Refit the terminal cover and the link cover assembly to the appropriate section of the contactor and secure them with the screws.

(8) Check that the contactor is bonded in accordance with 20-27-11.

E. Conclusion

(1) Make available electrical ground power as detailed in 24-41-00, and check the operation of the contactor by carrying out the appropriate test procedure.

(2) Refit the sidewall panel, FS or KS (Ref. 25-52-00), as appropriate, in the lower baggage compartment.

(3) Close the lower baggage compartment door.

DE-ICING CONTROL AND INDICATION - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

CAUTION: IF AN "INT 1&2", "INT 3&4" or "CYCLIC" CAPTION IS ILLUMINATED WITH THE SYSTEM SWITCHED OFF, ISOLATE THE ASSOCIATED HEATING POWER SUPPLIES IMMEDIATELY (REF. PARA.2.).

1. General

R This topic comprises an Operational Test and a Functional Test. The Functional Test is divided, for convenience of application, into four separate Tests, under individual headings. A System Test is not applicable.

The Operational Test utilizes the built-in test facility to individually check the left-hand and right-hand cyclic and continuous de-icing sub-systems.

The system switches, captions and cyclic counters referred to in the tests are located on the WING & INTAKE ANTI-ICING control panel, part of panel 4-211, and the CYCLIC & CONTINUOUS DE-ICING diagnostic panel (8-214).

The system TEST switch should be operated preferably but not essentially through a sequence which ensures that each 'on' position is used once only, e.g., LH OFF - LH CYC - LH OFF - LH CON - RH CON - RH OFF - RH CYC - RH OFF. To allow for cooling of the heating elements, subsequent retests at CYC positions should not be attempted within 1 min. Retests at CON positions cannot be carried out within 2.5 min.

In the Functional Tests, the dormant features of the system are checked with the aid of a test set. Therefore, to prevent unnecessary delays due to non-dormant faults, successful Operational Tests should have already been carried out.

An Emergency Isolation Procedure is included as a safeguard against overheating of the heating elements, should contacts of a continuous heating control relay or three-phase contactor be in the energized position with the system switched off. Such a fault condition is indicated by the illumination of the associated caption or captions.

2. Emergency Isolation Procedure

A. Equipment and Materials

DESCRIPTION	PART NO.
R Circuit breaker safety clips	-

B. Isolate

(1) If practicable, isolate the electrical generation and external power supplies as detailed in 24-00-00, Servicing.

(2) Trip and fit safety clips to the appropriate circuit breakers listed below.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 1&2 caption illuminated:			
INT 2 AUX DOOR D BOX HTR SUP	13-215	2H1411	A9
INT 2 REAR RAMP HTR SUP	13-215	2H1415	A10
INT 1 REAR RAMP HTR SUP	14-215	1H1415	B6
INT 1 AUX DOOR D BOX HTR SUP	14-215	1H1411	B7
LH WING SECT 13.7 & 15.3 HTRS CONTN SUP	14-215	1H372	C6
LH WING SECT 14.1 & 14.2 HTRS CONTN SUP	14-215	1H373	C7
LH WING FAIRING & SECT 13.1 HTRS CONTN SUP	14-215	1H403	C8
LH WING SECT 13.5 & 13.6 HTRS CONTN SUP	14-215	1H371	D6
LH WING SECT 15.1 & 15.2 HTRS CONTN SUP	14-215	1H374	D7
LH WING SECT 13.2 13.3 &	14-215	1H406	D8

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
13.4 HTRS CONTN SUP			
INT 3&4 caption illuminated:			
INT 3 AUX DOOR D BOX HTR SUP	13-216	3H1411	A10
INT 3 REAR RAMP HTR SUP	13-216	3H1415	A11
INT 4 REAR RAMP HTR SUP	14-216	4H1415	A14
INT 4 AUX DOOR D BOX HTR SUP	14-216	4H1411	A15
RH WING SECT 13.7 & 15.3 HTRS CONTN SUP	14-216	2H372	B12
RH WING SECT 14.1 & 14.2 HTRS CONTN SUP	14-216	2H373	B13
RH WING FAIRING & SECT 13.1 HTRS CONTN SUP	14-216	2H403	B15
RH WING SECT 13.5 & 13.6 HTRS CONTN SUP	14-216	2H371	C12
RH WING SECT 15.1 & 15.2 HTRS CONTN SUP	14-216	2H374	C13
RH WING SECT 13.2 13.3 & 13.4 HTRS CONTN SUP	14-216	2H406	C15
Left CYCLIC caption(s) illuminated:			
LH CYCLIC TIMER CONT	3-213	1H1835	B11
Right CYCLIC caption(s) illuminated:			
R RH CYCLIC TIMER CONT	15-216	2H1835	D14

3. Operational Test (System Fast Test)(Ref. Fig. 501)

A. Equipment and Materials

DESCRIPTION	PART NO.
Stop watch	-
Circuit breaker safety clips	-

B. Prepare

CAUTION: ENSURE THAT ALL APPLICABLE DE-ICED AREAS ARE FREE FROM PROTECTIVE COVERS, ETC., FOR THE DURATION OF THE TESTS.

WHEN SUPPORTING THE AUXILIARY INLET VANES IN THE OPEN POSITION, TAKE CARE NOT TO DAMAGE THE VANE STRUCTURE OR THE 'D' BOX DE-ICING MATS.

NOTE: Operation (1) is not required for the cyclic de-icing tests.

(1) Observing the safety precautions detailed in 71-62-00, Servicing, open more than 8 deg the auxiliary inlet vanes of the appropriate left and/or right engine intakes, and securely support them in this position.

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Ensure that the system MAIN, ALTERN and TEST switches are at an 'off' position, and that no system captions are illuminated.

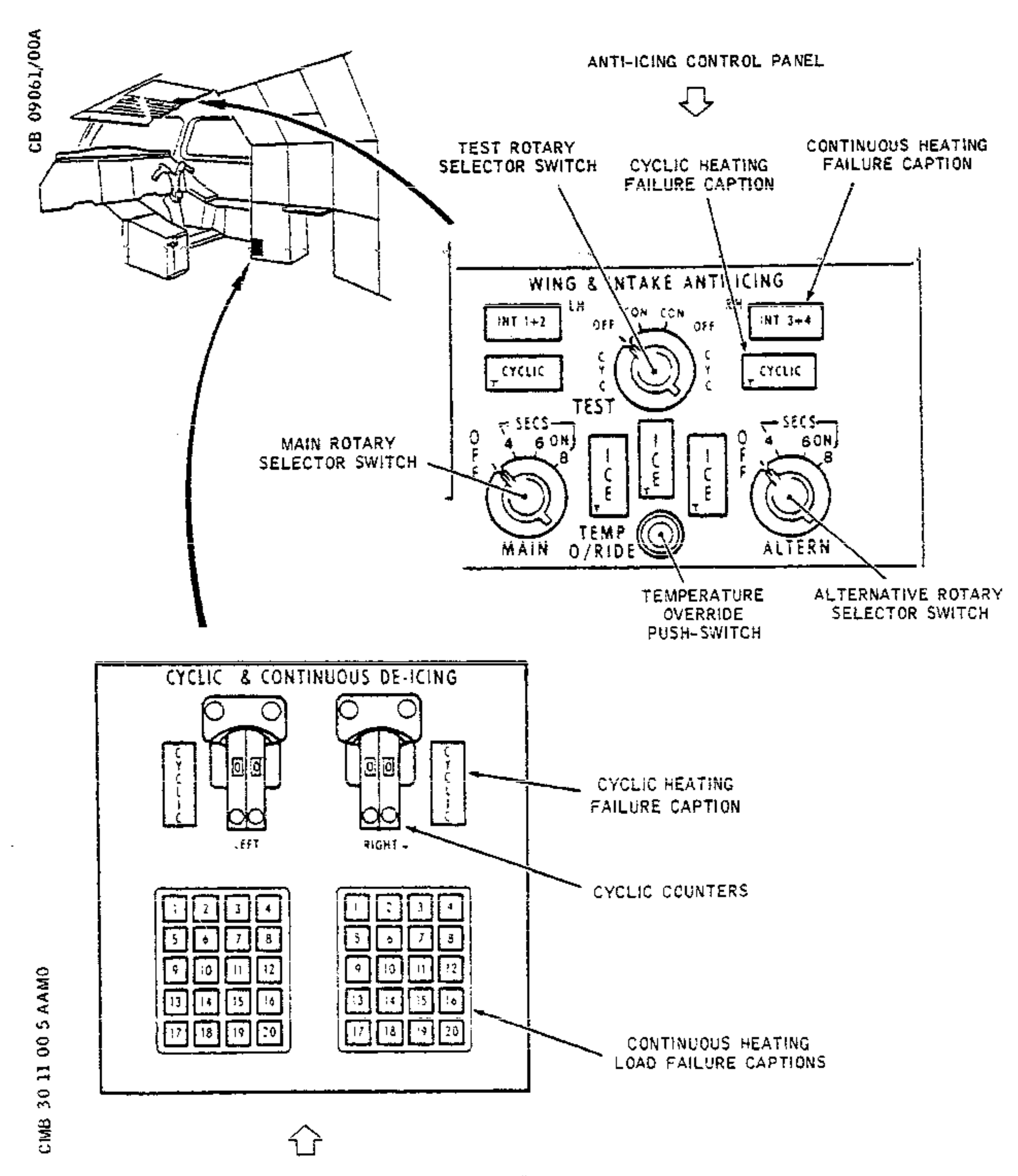
C. Test Left Cyclic De-icing

(1) Set the system TEST switch to the "LH CYC" position and check that -

(a) the left-hand cyclic counters on panel 8-214 step in numerical sequence, at 0.5 s intervals through stations 00 to 37, then reset and stop at station 00, and

(b) the counters and the left-hand CYCLIC captions remain unilluminated through stations 00 to 37 and are then illuminated at station 00.

NOTE: If during a cyclic test the cyclic counters stop



R

Anti-icing Control and Diagnostic Panels
Figure 501

counting, and the counters and associated CYCLIC captions are illuminated, the numerals displayed indicate a fault in the associated load or control circuit.

The test sequence may be resumed by first setting the TEST switch to an 'off' position and then returning it to the appropriate cyclic test position. If such resetting action is required for the first five consecutive pulses, the test cycle must be terminated. Otherwise, resetting action may be carried out any number of times to complete a test cycle, provided the pulse numbers are noted.

(2) Return the TEST switch to the "LH OFF" position and ensure that the captions and counter lights are extinguished.

D. Test Left Continuous De-icing

NOTE: The tests may be combined if the left and right continuous de-icing sub-systems are to be tested. The TEST switch can be set from one "CON" position to another, instead of to the nearest 'off' position, but it must be borne in mind that a 2 min 30 s delay will result if the switch is moved through the "CON" position.

(1) Set the TEST switch to the "LH CON" position and check that -

(a) all the left-hand numbered captions on panel 8-214 remain extinguished during the initial 3 s after selection, and that left-hand captions 1 to 10 inclusive are then illuminated for a period of 3 s only, and

(b) the INT 1&2 caption on panel 4-211 remains extinguished for the initial 3 s and is also illuminated for 3 s only.

CAUTION: IF THE TEST CIRCUIT BECOMES REACTIVATED BEFORE 2 min 30 s HAVE ELAPSED, SWITCH OFF IMMEDIATELY.

(2) Return the TEST switch to the nearest 'off' position. Within 2 min 30 s set the switch back to the "LH CON" position and check that the test circuit is not reactivated. This can be checked by observing the kW/kVAR meters on panel 3-214;

if an extra load is indicated when the switch is operated, the test circuit has become reactivated.

(3) Return the TEST switch to the nearest 'off' position, then remove the supports and allow the appropriate auxiliary inlet vanes to close.

(4) When the 2 min 30 s required for de-energization of the retest relay have elapsed, repeat operation (1) but check this time that left-hand numbered captions 9 and 10 remain extinguished.

(5) Return the TEST switch to the nearest 'off' position.

E. Test Right Continuous De-icing

(1) Set the TEST switch to the "RH CON" position and check that:

(a) all the right-hand numbered captions on panel 8-214 remain extinguished during the initial 3 s after selection, and that right-hand captions 1 to 10 inclusive are then illuminated for a period of 3 s only, and

(b) the INT 3&4 caption on panel 4-211 remains extinguished for the initial 3 s and is also illuminated for 3 s only.

CAUTION: IF THE TEST CIRCUIT BECOMES REACTIVATED BEFORE 2 min 30 s HAVE ELAPSED, SWITCH OFF IMMEDIATELY.

(2) Return the TEST switch to the nearest 'off' position. Within 2 min 30 s set the switch back to the "RH CON" position and check that the test circuit is not reactivated. This can be checked by observing the kW/kVAR meters on panel 3-214. If an extra load is indicated when the switch is operated, the test circuit has become reactivated.

(3) Return the TEST switch to the nearest 'off' position, then remove the supports and allow the appropriate auxiliary inlet vanes to close.

(4) When the 2 min 30 s required for de-energization of the retest relay have elapsed, repeat operation (1) but check this time that right-hand numbered captions 9 and 10 remain extinguished.

(5) Return the TEST switch to the nearest 'off' position.

F. Test Right Cyclic De-icing

(1) Set the system TEST switch to the "RH CYC" position and check that:

(a) the right-hand cyclic counters on panel 8-214 step in numerical sequence, at 0.5 s intervals through stations 00 to 37, then reset and stop at station 00, and

(b) the counters and the right-hand CYCLIC captions remain unilluminated through stations 00 to 37 and are then illuminated at station 00

NOTE: If during a cyclic test the cyclic counters stop counting, and the counters and associated CYCLIC captions are illuminated, the numerals displayed indicate a fault in the associated load or control circuit.

The test sequence may be resumed by first setting the TEST switch to an 'off' position and then returning it to the appropriate cyclic test position. If such resetting action is required for the first five consecutive pulses, the test cycle must be terminated. Otherwise, resetting action may be carried out any number of times to complete a test cycle, provided the pulse numbers are noted.

(2) Return the TEST switch to the "RH OFF" position and ensure that the captions and counter lights are extinguished.

G. Conclusion

(1) Switch off and disconnect electrical ground power as detailed in 24-41-00, Servicing.

(2) Observing the safety precautions detailed in 71-62-00, Servicing, remove the supports and allow the auxiliary inlet vanes to close.

(3) Refit any protective covers, etc., removed during preparation for test.

4. Functional Test - Protective Devices, Cyclic Pulse Duration
R and Timer Protection Circuits (Ref. Fig.502 and 503)

A. Equipment and Materials

DESCRIPTION	PART NO.
De-icing system test set, with three test cables	TE 6063000
Stop watch	-
Circuit breaker safety clips	-

NOTE: With regard to the test set controls, the term 'down' signifies the TEST CYC, RUN, NORMAL, unmarked or fully counter-clockwise position. When required, test cables should be connected as follows:-

Cable 1 - between test set connector 1 and CTPU fixed connector 1H1839-D (2H1839-D).

Cable 2 - between test set connector 2 and CTPU fixed connector 1H1839-B (2H1839-B).

Cable 3 - between test set connector 3 and CTPU free connector 1H1839-B (2H1839-B).

NOTE: Unless instructed otherwise, disregard the test set FAULT ANNUNCIATORS in the following tests.

B. Prepare to Test Protective Devices, etc.

CAUTION: FAILURE TO CARRY OUT THE FOLLOWING TWO OPERATIONS WILL CAUSE OVERHEATING AND SUBSEQUENT DAMAGE TO A LARGE NUMBER OF HEATING ELEMENTS.

(1) Trip and fit safety clips to the following continuous heating circuit breakers -

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 2 AUX DOOR D BOX HTR SUP	13-215	2H1411	A9
INT 2 REAR RAMP HTR SUP	13-215	2H1415	A10
INT 1 REAR RAMP HTR SUP	14-215	1H1415	B6
INT 1 AUX DOOR D BOX HTR SUP	14-215	1H1411	B7
LH WING SECT 13.7 & 15.3 HTRS CONTN SUP	14-215	1H372	C6
LH WING SECT 14.1 & 14.2 HTRS CONTN SUP	14-215	1H373	C7
LH WING FAIRING & SECT 13.1 HTRS CONTN SUP	14-215	1H403	C8
LH WING SECT 13.5 & 13.6 HTRS CONTN SUP	14-215	1H371	D6
LH WING SECT 15.1 & 15.2 HTRS CONTN SUP	14-215	1H374	D7
LH WING SECT 13.2, 13.3 & 13.4 HTRS CONTN SUP	14-215	1H406	D8
RH WING CONTN IND	15-215	H1512	B11
LH WING CONTN IND	15-216	H1511	B15
INT 4 REAR RAMP HTR SUP	14-216	4H1415	A14
INT 4 AUX DOOR D BOX HTR SUP	14-216	4H1411	A15
RH WING SECT 13.7 & 15.3 HTRS CONTN SUP	14-216	2H372	B12
RH WING SECT 14.1 & 14.2 HTRS CONTN SUP	14-216	2H373	B13

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
RH WING FAIRING & SECT 13.1 HTRS CONTN SUP	14-216	2H403	B15
RH WING SECT 13.5 & 13.6 HTRS CONTN SUP	14-216	2H371	C12
RH WING SECT 15.1 & 15.2 HTRS CONTN SUP	14-216	2H374	C13
RH WING SECT 13.2, 3 & 4	14-216	2H406	C15
INT 3 AUX DOOR D BOX HTR SUP	13-216	3H1411	A10
INT 3 REAR RAMP HTR SUP	13-216	3H1415	A11

R B CAUTION: FAILURE TO CARRY OUT THE FOLLOWING
R B OPERATION WILL CAUSE OVERHEATING AND
R B SUBSEQUENT DAMAGE TO A LARGE NUMBER OF
R B HEATING ELEMENTS.

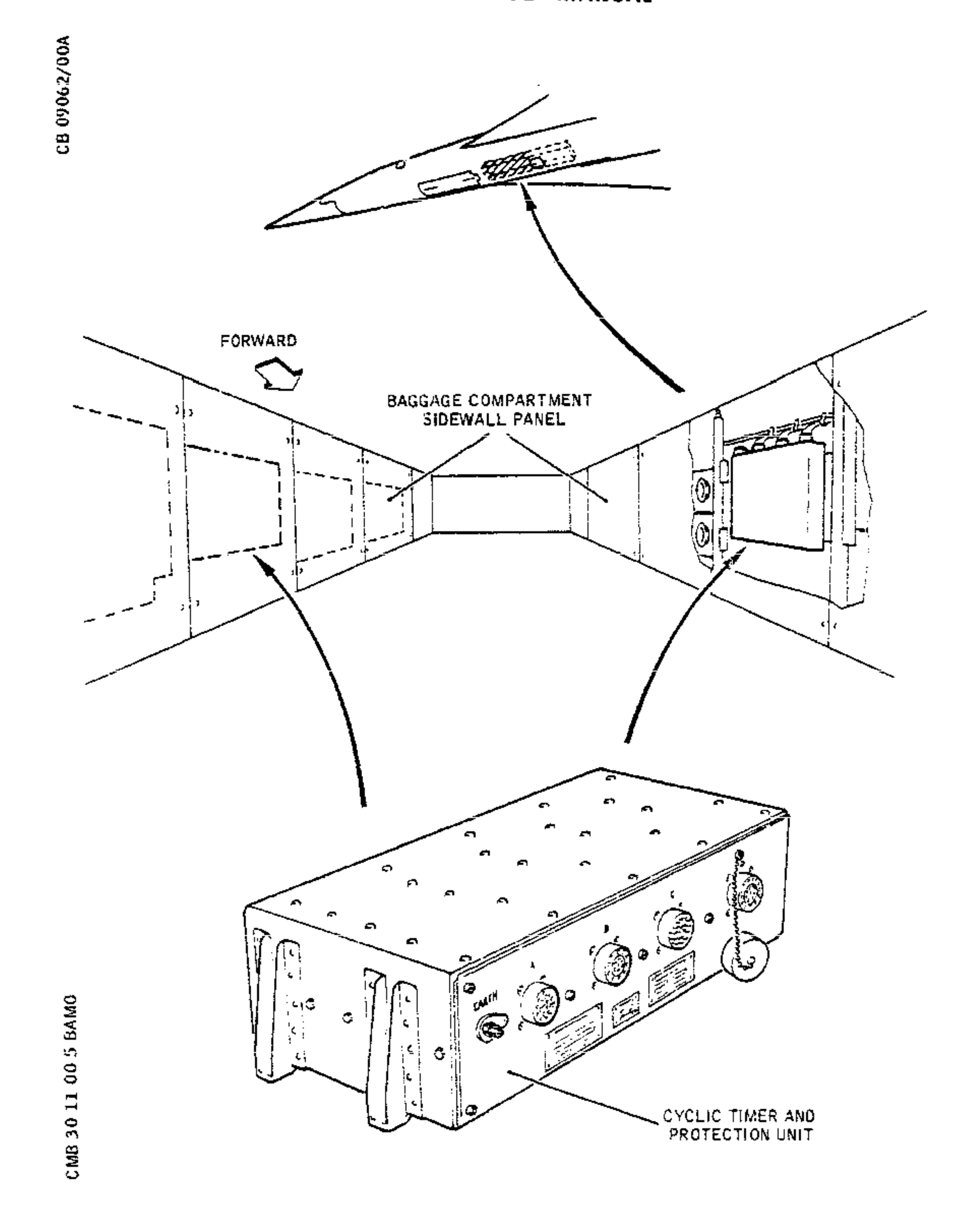
(2) In the underfloor baggage compartment, gain access to the left and right cyclic timer and protection units (CTPUs), then isolate the cyclic heating contactors by disconnecting and pulling back connectors 1H1839-B and 2H1839-B.

(3) First ensuring that all the controls are in the 'down' position, connect the test set to the appropriate left or right CTPU with test cables 1 and 2.

(4) Ensure that all services liable to be adversely affected by the tripping of the left weight switch circuit breaker are effectively isolated (Ref. 7-11-00), except for this system.

(5) Trip and fit a safety clip to the LH UC WEIGHT SW A SYS SUP circuit breaker G292, panel 1-213, map ref.M17.

(6) On panel 9-211, set the ADC 1 master and ADC 1 - TEST selector switches to the "ON" and "1"



Location of Cyclic Timer and Protection Units (CTPU's)
Figure 502

positions respectively.

(7) On panel 4-211, ensure that the system MAIN, ALTERN and TEST selector switches are at an 'off' position.

(8) Make available electrical ground power as detailed in 24-41-00.

NOTE: In the following tests, the CYCLIC captions of the system not under test, i.e., the right or left system, will be illuminated each time the MAIN selector switch on panel 4-211 is at the "4 SECS - ON" position. These indications should be disregarded.

C. Test Cyclic Pulse Duration

(1) On the test set, set the POWER switch to "ON" and the centre CURRENT INHIBIT switch to "INHIBIT".
R B Set 'NORMAL/TEST' switch to 'test'.

(2) Set the right CYCLIC CONTROL switch to "CYC START" and check that the PULSE NO counters step in numerical sequence from 00 to 37 and then reset to 00 in an elapsed time of between 17 and 21 s.

NOTE: The CYC FAIL amber annunciator will be illuminated at the end of the test cycle.

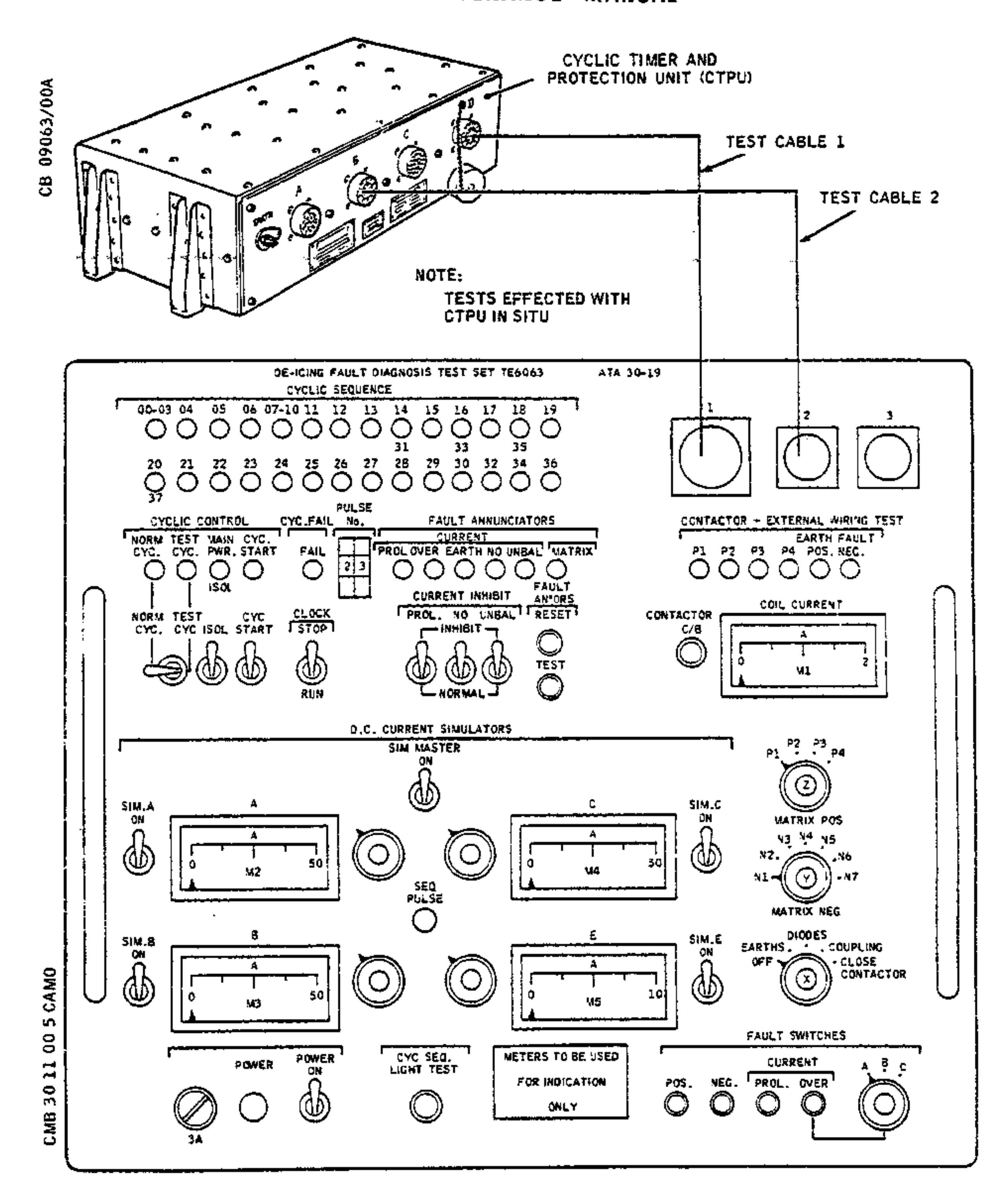
(3) Set the right CYCLIC CONTROL switch to 'down', then press and release the RESET push-switch.

(4) Start the system cycling with a pulse duration of 4 s, by setting the MAIN selector switch on panel 4-211 to "4 SECS - ON". Check that the cyclic counters on panel 8-214 step in numerical sequence from 00 to 37 and then reset to 00 in an elapsed time of between 2 min 17 s and 2 min 47 s.
R B Return 'NORMAL/TEST' switch to 'NORMAL'.

D. Test Cyclic Isolation and Cyclic Reset

(1) On the test set, set the centre CYCLIC CONTROL switch to "ISOL" for at least 2 s, then return it to 'down'. Check that the CYC FAIL amber annunciator on the test set, and the CYCLIC caption on panel 4-211, are and remain illuminated. Disregard the pulse indications.

(2) Press and release the illuminated CYCLIC caption and check that it is extinguished.



De-icing Test Set TE6063000
Figure 503

R

(3) Return the MAIN selector switch to "OFF".

E. Test Prolonged Current Protection

(1) On the test set return the right CYCLIC CONTROL and POWER switches to 'down'.

WARNING: 200/115 V IS PRESENT AT THE THREE-PHASE CONTACTOR TERMINALS.

(2) Inhibit the three-phase contactor control of the cyclic failure warning circuit by disconnecting the electrical connector from the system three-phase contactor, 1H1843, panel 24-215 for the left system or 2H1843, panel 24-216 for the right system.

(3) On the test set, set the POWER switch to "ON" and then on panel 4-211, set the MAIN selector switch to "4 SECS - ON". The system will reset the PULSE NO counters on the test set to 00 and then cycle with a pulse duration of 4 s.

(4) Stop the system cycling on any pulse other than 04, 11, 20 or 37 by setting the CLOCK switch to "STOP"; then set the left CURRENT INHIBIT switch to "INHIBIT" and the SIM A, SIM B, SIM C and SIM MASTER switches to "ON".

(5) Carefully operate the controls adjacent to meters A, B and C until a simulated load current of 15 A is indicated on each meter.

(6) Return the centre CURRENT INHIBIT switch to "NORMAL" and, if the UNBAL amber annunciator is illuminated, press and release the RESET push-switch.

(7) With 15 A simulated on all three phases, set the left CURRENT INHIBIT switch to "NORMAL" and check that, between 9.5 and 12 s elapsed time, the green and appropriate red sequence annunciators are extinguished (signifying cyclic isolation) and the CYC FAIL amber annunciator is illuminated.

(8) Return the MAIN selector switch on panel 4-211 to "OFF" then, on the test set, set the CLOCK switch to "RUN" and the left CURRENT INHIBIT switch to "INHIBIT", then press and release the RESET push-switch.

F. Test Unbalanced Current Protection

(1) Set the MAIN selector switch on panel 4-211 to "4 SECS - ON", and the system will reset the PULSE NO counters to 00 and then cycle with a pulse duration of 4 s.

(2) Stop the system cycling on any pulse other than 04, 11, 20 or 37 by setting the CLOCK switch to "STOP".

(3) Carefully operate the control adjacent to meter A, B or C to reduce the simulated current in one phase. Check that when the meter is indicating between 10.1 and 9.1 A, the CYC FAIL amber annunciator is illuminated and the green and appropriate red sequence annunciators remain illuminated.

(4) Return the simulated current in the reduced phase to 15 A, then press and release the RESET push-switch.

G. Test No-current Protection

(1) Set the right CURRENT INHIBIT switch to "INHIBIT".

(2) Carefully operate the control adjacent to meter A to reduce the simulated current in phase A. Check that when the meter is indicating between 5 and 2 A, the CYC FAIL amber annunciator illuminates and the green and appropriate red sequence annunciators remain illuminated.

(3) Return the simulated current in phase A to 15 A, then press and release the RESET push-switch.

H. Test Overcurrent Protection

(1) Set the rotary FAULT switch to the phase "A" position, then press and release the OVER push-switch. Check that the green and appropriate red sequence annunciators are extinguished and the CYC FAIL amber annunciator is illuminated.

(2) Return the MAIN selector switch on panel 4-211 to "OFF" then, at the test set, press and release the RESET push-switch and then set the CLOCK switch to "RUN".

(3) Set the MAIN selector switch on panel 4-211 to "4 SECS - ON" then, at the test set, stop the system cycling on any pulse other than 04, 11, 20 or 37 by setting the CLOCK switch to "STOP". Note that the SEQ PULSE green annunciator is illuminated.

(4) Repeat operations (1), (2) and (3) with the rotary FAULT switch set to the phase "B" and then phase "C" positions in turn.

I. Test Earth Current Protection

(1) Note the pulse or pulses indicated by the illuminated CYCLIC SEQUENCE red annunciator, and then set the centre CURRENT INHIBIT switch to "INHIBIT".

(2) Return the SIM A, SIM B and SIM C switches to 'down'; then set the SIM E switch to "ON".

(3) Carefully operate the control adjacent to meter E and check that when the meter is indicating between 2 and 4 A the green and red sequence annunciators are extinguished (in this test only, signifying inhibition of the load). Do not readjust the SIM 'E' current setting control, as the setting is required for the prolonged earth current protection test.

(4) Return the SIM E switch to 'down' and set the CLOCK switch to "RUN". Check over at least two complete cycles of thirty-eight pulses that the load remains inhibited, i.e., the green and appropriate red sequence annunciators remain extinguished for the duration of each pulse noted in operation (1).

(5) Set the MAIN selector switch on panel 4-211 to "OFF" and then back to "4 SEC - ON", then, at the test set, press and release the RESET push-switch.

J. Test Prolonged Earth Current Protection

(1) Set the left and right CURRENT INHIBIT switches to "NORMAL", then set the SIM E switch to "ON". Check that the green and appropriate red sequence annunciators extinguish at each pulse for the remainder
R of the sequence.

(2) Set the MAIN selector switch on panel 4-211 to "OFF" and then back to "4SEC-ON", then, at the test set, press and release the RESET push-switch.

(3) With the green and red sequence annunicators exting-
R uishing at each pulse, hold depressed the PROL push-switch and check that within 1 s the green and appropriate red sequence annunciators are extinguished and the CYC FAIL amber annunciator is illuminated. Release the push-switch.

(4) Set the SIM E switch to 'down'; then press and release the RESET push-switch.

(5) On panel 4-211 set the MAIN selector switch to "OFF".

K. Test Positive Switch Matrix Protection

(1) On panel 4-211 set the MAIN selector switch to "4 SECS - ON" then, at the test set, stop the system cycling at pulse 04 by setting the CLOCK switch to "STOP".

(2) Set the MATRIX POS rotary switch to "P4"; then press and release the POS push-switch. Check that the green and appropriate red sequence annunciators remain illuminated.

(3) Set the MATRIX POS rotary switch to "P1"; then press and release the POS push-switch. Check that the green and appropriate red sequence annunciators are extinguished and the CYC FAIL amber annunciator is illuminated.

(4) On panel 4-211, set the MAIN selector switch to "OFF" then, at the test set, set the CLOCK switch to "RUN" and press and release the RESET push-switch.

(5) Repeat operations (1), (3) and (4) with the MATRIX POS switch set to the "P2" and then "P3" positions in turn.

L. Test Negative Switch Matrix Protection

(1) On panel 4-211, set the MAIN selector switch to "4 SECS - ON" then, at the test set, stop the system cycling at pulse 05 by setting the CLOCK switch to "STOP".

(2) Set the MATRIX NEG rotary switch to "N1"; then press and release the NEG push-switch. Check that the green and appropriate red sequence annunciators remain illuminated.

(3) Set the MATRIX NEG rotary switch to "N2"; then press and release the NEG push-switch. Check that the green and appropriate red sequence annunciators are extinguished and the CYC FAIL amber annunciator is illuminated.

(4) At panel 4-211, set the MAIN selector switch to "OFF" then, at the test set, set the CLOCK switch to "RUN"

and press and release the RESET switch.

(5) Repeat operations (1), (3) and (4) with the MATRIX NEG switch set to the "N3", "N4", "N5", "N6" and "N7" positions in turn.

M. Test Cyclic Inadvertent-on Warning

(1) On the test set, return the POWER switch to 'down'.

WARNING: 200/115 V IS PRESENT AT THE THREE-PHASE CONTACTOR TERMINALS.

(2) First ensuring that the mating surfaces are clean and undamaged, refit the electrical connector to the system three-phase contactor, 1H1843, panel 24-215 for the left system or 2H1843, panel 24-216 for the right system.

(3) On panel 4-211, ensure that the MAIN, ALTERN and TEST selector switches are at an 'off' position.

(4) On the test set, set the POWER switch to "ON".

(5) Set the right CYCLIC CONTROL switch to "CYC START" and note that a full test cycle of thirty-eight, 0.5 s pulses is completed satisfactorily and the CYC FAIL amber annunciator illuminates; then return the right CYCLIC CONTROL switch to 'down'; and the CYC FAIL amber annunciator extinguishes.

(6) Reset the following circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
RH WING CONTN IND	15-215	H1512	B11
LH WING CONTN IND	15-216	H1511	B15

(7) Set the right CYCLIC CONTROL switch to "CYC START", and check that the CYC FAIL amber annunciator is illuminated continuously during the resulting test cycle. Approximately half-way through this test cycle, set the TEST selector switch on panel 4-211 to the alternative 'off' position; check that the CYC FAIL amber annunciator is illuminated for the

remainder of the test cycle.

(8) Return all test set controls to the 'down' position.

N. Test Continuous Inadvertent-on Warning

(1) Trip and fit a safety clip to the following left or right circuit breaker, as appropriate:-

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH WING CONTN IND	15-216	H1511	B15
RH WING CONTN IND	15-215	H1512	B11

(2) Using suitable adapters, connect a shorting-link between terminals B1 and B2 of left control relay 1H1846, panel 1-131, or right control relay 2H1846, panel 1-132.

(3) Reset the circuit breaker tripped in operation (1) and check that the INT 1&2 or INT 3&4 caption on panel 4-211 is illuminated; then once again trip the circuit breaker.

(4) Remove the link from the control relay; then reset the circuit breaker.

O. Conclusion

(1) Disconnect the test cables from the CTPU.

(2) First ensuring that the mating surfaces are clean and undamaged, refit connectors 1H1839-B and 2H1839-B to the CTPUs.

(3) Refit the trim panels; then remove all test equipment from the baggage compartment.

(4) Reset the continuous heating circuit breakers (Ref. para.B.(1)).

(5) Carry out an Operational Test of the left and right cyclic de-icing (Ref. para.3.).

5. Functional Test - ADC Override

A. Equipment and Materials

DESCRIPTION	PART NO.
Multimeter, e.g., Avometer Type 8	-
Circuit breaker safety clips	-

B. Prepare to Test ADC Override

CAUTION: FAILURE TO CARRY OUT THE FOLLOWING OPERATION WILL CAUSE OVERHEATING AND SUBSEQUENT DAMAGE TO A LARGE NUMBER OF HEATING ELEMENTS.

(1) Trip and fit safety clips to the following control circuit breakers:-

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH WING ALTN CONTN CONT	15-215	1H1834	F11
LH CYCLIC ALTN CONT	15-215	1H1828	F13
RH WING ALTN CONTN CONT	15-216	2H1834	F17
RH CYCLIC ALTN CONT	15-216	2H1828	F19

(2) Ensure that the ADC 2 master switch on panel 9-211 is set to the OFF position.

(3) Ensure that all services liable to be adversely affected by the tripping of the right weight switch circuit breaker are effectively isolated (Ref. 7-11-00), except for this system.

(4) Trip and fit a safety clip to the RH UC WEIGHT SW B SYS SUP circuit breaker G294, panel 3-213, map ref.B9.

(5) Make available electrical ground power as detailed in 24-41-00.

C. Test ADC Override

(1) Set the ALTERN selector switch on panel 4-211 to the "4 SECS - ON" position.

(2) Check that there is no d.c. voltage present at the input side of one of the control circuit breakers tripped in operation B.(1).

(3) Press and release the TEMP O/RIDE push-switch on panel 4-211 and check that 28 V d.c. becomes available at the input side of the control circuit breaker.

(4) Return the ALTERN selector switch to the "OFF" position and check that once again there is no d.c. voltage present at the input side of the control circuit breaker.

D. Conclusion

(1) Reset the RH UC WEIGHT SW B SYS SUP circuit breaker G294, panel 3-213, map ref.B9; then reinstate the associated services (Ref. 7-11-00).

(2) Reset the control circuit breakers tripped in operation B.(1).

(3) Switch off and disconnect electrical ground power as detailed in 24-41-00.

6. Functional Test - Auxiliary Inlet Door Heating

A. Equipment and Materials

DESCRIPTION	PART NO.
Stop watch	-

B. Prepare to Test Auxiliary Inlet Door Heating

CAUTION: ENSURE THAT ALL APPLICABLE DE-ICED AREAS ARE FREE FROM PROTECTIVE COVERS, ETC., FOR THE DURATION OF THE TEST.

WHEN SUPPORTING THE AUXILIARY INLET VANES, I.E., DOORS, IN THE OPEN POSITION, TAKE CARE NOT TO DAMAGE THE VANE STRUCTURE OR THE 'D' BOX DE-ICING MATS.

(1) Observing the safety precautions detailed in 71-62-00, Servicing, open more than 8 deg the auxiliary inlet vanes of the appropriate left or right engine intakes, and securely support them in this position.

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Ensure that the system MAIN, ALTERN and TEST selector switches on panel 4-211 are at an 'off' position, and that no system captions are illuminated.

C. Test Auxiliary Inlet Door Heating

(1) Set the TEST selector switch on panel 4-211 to the required LH or RH "CON" position and check that -

(a) all the associated left or right numbered captions on panel 8-214 remain extinguished during the initial 3 s after selection, and

(b) associated left or right captions 1 to 10 inclusive are then illuminated for a period of 3 s only.

NOTE: During the preceding operation (1) the INT 1&2 or INT 3&4 caption on panel 4-211 also remains extinguished for the initial 3 s and is then illuminated for 3 s only.

(2) Return the TEST switch to the nearest "OFF" position.

(3) Wait the 2 min 30 s required for de-energization of the retest relay; during this period, remove the supports and allow the auxiliary inlet vanes to close.

(4) Repeat operation (1), but check this time that numbered captions 9 and 10 remain extinguished throughout the test.

(5) Return the TEST switch to the nearest "OFF" position.

D. Conclusion

(1) Switch off and disconnect electrical ground power

as detailed in 24-41-00.

(2) Refit any protective covers, etc., removed during preparation for test.

7. Functional Test - Control Selection

A. Equipment and Materials

DESCRIPTION	PART NO.
Multimeter, e.g., Avometer Type 8	-
Circuit breaker safety clips	-

B. Prepare to Test Control Selection

CAUTION: FAILURE TO CARRY OUT THE FOLLOWING TWO OPERATIONS WILL CAUSE OVERHEATING AND SUBSEQUENT DAMAGE TO A LARGE NUMBER OF HEATING ELEMENTS.

(1) Disconnect and pull back connectors 1H1839-B and 2H1839-B from the left and right CTPUs, which are located in zones 131 and 132 respectively.

(2) Trip and fit safety clips to all of the following continuous heating circuit breakers -

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
INT 2 AUX DOOR D BOX HTR SUP	13-215	2H1411	A9
INT 2 REAR RAMP HTR SUP	13-215	2H1415	A10
INT 1 REAR RAMP HTR SUP	14-215	1H1415	B6
INT 1 AUX DOOR D BOX HTR SUP	14-215	1H1411	B7
LH WING SECT 13.7 & 15.3 HTRS CONTN SUP	14-215	1H372	C6

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH WING SECT 14.1 & 14.2 HTRS CONTN SUP	14-215	1H373	C7
LH WING FAIRING & SECT 13.1 HTRS CONTN SUP	14-215	1H403	C8
LH WING SECT 13.5 & 13.6 HTRS CONTN SUP	14-215	1H371	D6
LH WING SECT 15.1 & 15.2 HTRS CONTN SUP	14-215	1H374	D7
LH WING SECT 13.2 13.3 & 13.4 HTRS CONTN SUP	14-215	1H406	D8
INT 3 AUX DOOR D BOX HTR SUP	13-216	3H1411	A10
INT 3 REAR RAMP HTR SUP	13-216	3H1415	A11
INT 4 REAR RAMP HTR SUP	14-216	4H1415	A14
INT 4 AUX DOOR D BOX HTR SUP	14-216	4H1411	A15
RH WING SECT 13.7 & 15.3 HTRS CONTN SUP	14-216	2H372	B12
RH WING SECT 14.1 & 14.2 HTRS CONTN SUP	14-216	2H373	B13
RH WING FAIRING & SECT 13.1 HTRS CONTN SUP	14-216	2H403	B15
RH WING SECT 13.5 & 13.6 HTRS CONTN SUP	14-216	2H371	C12
RH WING SECT 15.1 & 15.2 HTRS CONTN SUP	14-216	2H374	C13
RH WING SECT 13.2 13.3 & 13.4 HTRS CONTN SUP	14-216	2H406	C15

(3) Ensure that all services liable to be adversely

affected by the tripping of the left (right) weight switch circuit breaker are effectively isolated (Ref. 7-11-00), except for this system.

(4) Trip and fit a safety clip to the LH UC WEIGHT SW A SYS SUP circuit breaker G292, panel 1-213, map ref.M17 (RH UC WEIGHT SW B SYS SUP circuit breaker G294, panel 3-213, map ref.B9).

(5) Make available electrical ground power as detailed in 24-41-00.

C. Test Main Control Selection

(1) On panel 9-211, set the ADC 1 master and ADC 1 - TEST selector switches to the "ON" and "1" positions respectively.

(2) On panel 4-211, set the MAIN selector switch to the "4 SECS - ON" position. Check that the left and right cyclic systems operate as for a no-current failure condition with pulses of 4 s duration, i.e., the cyclic counters are first reset to 00, then count to 37 and reset to 00 at approximately 4 s intervals; the counters and associated CYCLIC captions will be illuminated for the duration of each pulse. Disregard the continuous heating captions.

NOTE: The system will continue to cycle for as long as the switch remains at the 4 SECS - ON position.

(3) Return the MAIN selector switch to the "OFF" position.

(4) Return the ADC 1 master switch to the "OFF" position.

D. Test Alternative Control Selection

(1) On panel 9-211, set the ADC 2 master and ADC 2 - TEST selector switches to the "ON" and "1" positions respectively.

(2) On panel 4-211, set the ALTERN selector switch to the "4 SECS - ON" position. Check that the left and right cyclic systems operate as for a no-current failure condition with pulses of 4 s duration, i.e., the cyclic counters are first reset to 00, then count to 37 and reset to

00 at approximately 4 s intervals; the counters and associated CYCLIC captions will be illuminated for the duration of each pulse. Disregard the continuous heating captions.

NOTE: The system will continue to cycle for as long as the switch remains at the 4 SECS - ON position.

(3) Return the ALTERN selector switch to the "OFF" position.

(4) Return the ADC 2 master switch to the "OFF" position.

E. Conclusion

(1) Reset the weight switch circuit breaker(s) tripped doing preparation, then reinstate the associated services.

(2) Return the ADC 1 - TEST (ADC 2 - TEST) selector switch to the "NORM" position.

(3) Connect the electrical connectors to the left and right CTPUs, first ensuring that the mating surfaces are clean and undamaged.

(4) Reset the continuous heating circuit breakers tripped during preparation.

(5) Carry out an Operational Test (System Fast Test) on the left and right Cyclic De-icing (Ref. para.3.).

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END OF THIS SECTION

NEXT

CYCLIC TIMER AND PROTECTION UNIT - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

The two cyclic timer and protection units (CTPUs), designated LH and RH respectively, are attached with screws to anti-vibration mounted panels, one in zone 131 and the other in zone 132.

2. Cyclic Timer and Protection Unit

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Torque spanner, 21 to 24 lbf in (0.237 to 0.271 mdaN)	-
R R Torq-set driver, for screw size 10, with suitable wrench	-

B. Prepare

(1) Electrically isolate the CTPU by tripping the appropriate circuit breakers listed below. Fit a safety clip to each tripped circuit breaker.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Both CTPUs			
WING & INT NORM CONT & SUP	15-215	1H1836	D10
WING & INT ALTN CONT & SUP	15-216	2H1836	E14
LH CTPU			

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
R LH WING & INT 1&2 CYCLIC IND	15-216	H1513	B14
R LH CYCLIC TIMER CONT	3-213	1H1835	B11
RH CTPU			
R RH CYCLIC TIMER CONT	15-216	2H1835	D14
R RH WING & INT 3&4 CYCLIC IND	15-215	H1514	B12

(2) Remove the appropriate baggage compartment sidewall panel.

C. Remove

(1) Disconnect the electrical connectors and remove the bonding lead from the unit earthing stud.

(2) Support the unit and, using the Torq-set driver and wrench, remove the four retaining screws and washers; remove the CTPU.

D. Install

(1) Comply with the electrical safety precautions.

(2) Support the CTPU in position and, using the Torq-set driver and wrench, secure it with the four retaining screws and washers.

(3) Connect the electrical connectors, first ensuring that the mating surfaces are clean and undamaged.

(4) Connect the bonding lead to the unit earthing stud, torque-tightening the nut to between 21 and 24 lbf in (0.237 and 0.271 mdaN).

(5) Ensure that the CTPU is bonded in accordance with 20-27-11.

E. Conclusion

(1) Refit the baggage compartment sidewall panel.

(2) Reset the circuit breakers tripped before removal.

(3) Carry out an Operational Test of the appropriate left or right cyclic de-icing system (Ref. 30-11-00).

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INTAKE CYCLIC HEATING SWITCH UNIT - REMOVAL/INSTALLATION

WARNING: ACCESS TO EACH SWITCH UNIT MUST BE GAINED ONLY AS DETAILED IN 71-63-00, SERVICING.

1. General

Each switch unit is attached to the roof of an engine intake, above and between the front and rear ramps. The ramps must be lowered to gain access.

2. Switch Unit (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner, 23 to 25 lbf in (0.260 to 0.283 mdaN)	-
Torque spanner, 40 to 45 lbf in (0.452 to 0.509 mdaN)	-

B. Prepare

(1) Observing all relevant WARNINGS, CAUTIONS and NOTES, lower the ramps to gain access to the appropriate switch unit, as detailed in 71-63-00, Servicing.

(2) Isolate the electrical generation and external power supplies as detailed in 24-00-00, Servicing.

C. Remove

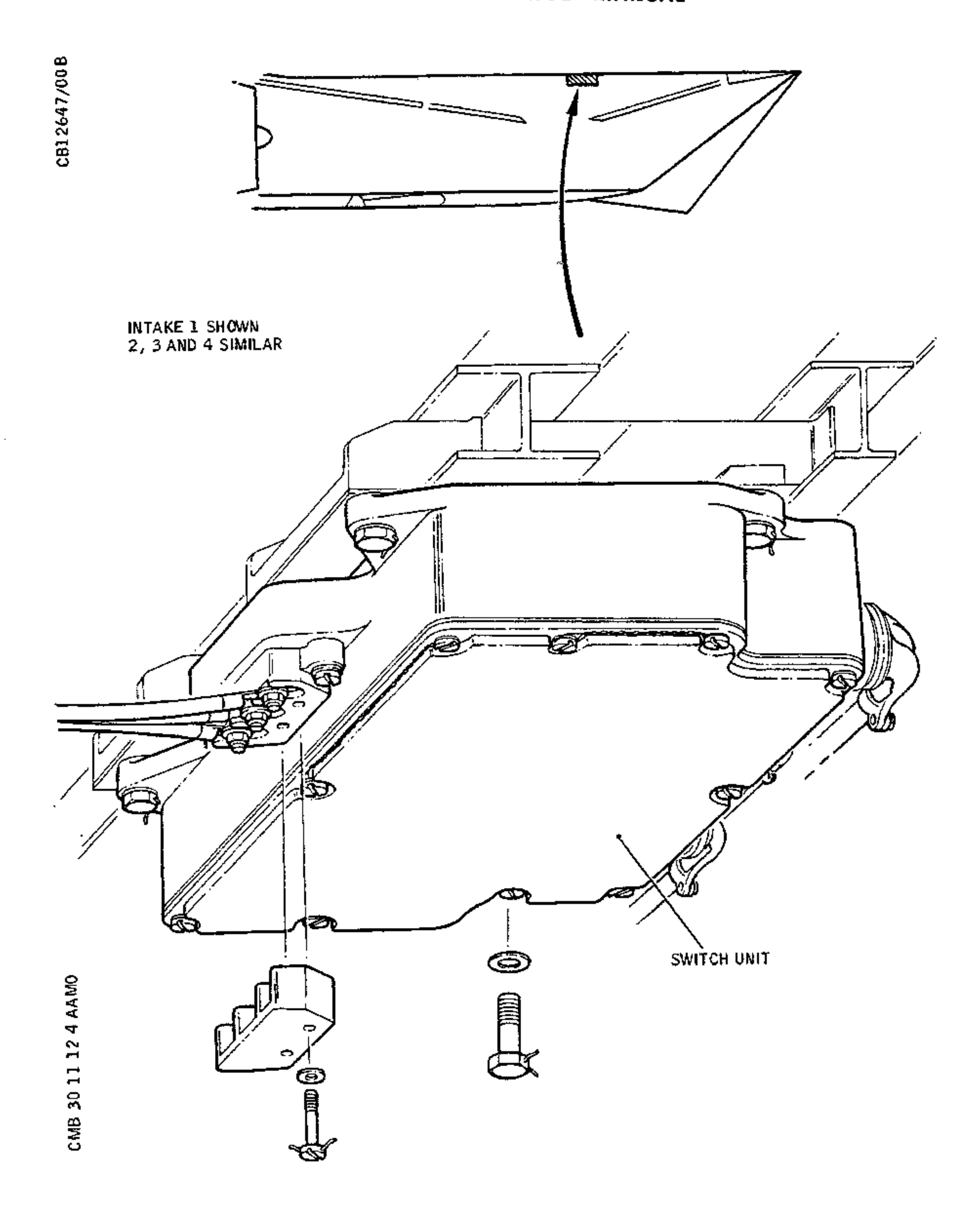
(1) Locate the switch unit in the intake roof.

(2) Remove the cover from the unit terminal block and disconnect the electrical cables from the terminal block.

(3) Pull back the protective boots and disconnect the electrical connectors.

(4) Remove the locking wire, then support the unit and remove the four retaining bolts and washers; remove the unit.

D. Install



R Switch Unit - Typical Installation
Figure 401

R (1) Ensure that the safety precautions taken in operation
R B.(1) have not been cancelled.

(2) Comply with the electrical safety precautions.

(3) Position the unit and secure it with the four retaining bolts and washers, torque-tightening the bolts to between 40 and 45 lbf in (0.452 and 0.509 mdaN).

<u>NOTE</u>: The forward retaining bolts are longer than the aft retaining bolts.

(4) Lock the retaining bolts with locking wire in accordance with 20-21-13.

(5) Connect the electrical cables to the unit terminal block, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram. Torque-tighten the terminal nuts to between 23 and 25 lbf in (0.260 and 0.283 mdaN).

(6) Fit the terminal block cover and secure it with the screws. Lock the screws with wire in accordance with 20-21-13.

(7) Connect the electrical connectors to the switch unit, first ensuring that the mating surfaces are clean and undamaged.

R (8) Fit the protective boots to the electrical connectors.

E. Conclusion

R (1) Ensure that all intake surfaces containing de-icing
R elements are free from extraneous articles, and that
R all persons are clear of the intakes.

R (2) Carry out an Operational Test of the appropriate left
R or right cyclic de-icing system (Ref. 30-11-00).

R (3) Observing all relevant WARNINGS, CAUTIONS and NOTES,
R carry out the procedures detailed in 71-63-00,
R Servicing, paragraph 2.D. Conclusion.

DIAGNOSTIC PANEL - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

The diagnostic panel is located on the forward leg of the third crew member's management panel. The panel is front-
R mounted, secured by four quick-release fasteners and
R protected by a guard rail.

Access to the electrical connectors at the rear of the panel is gained by releasing the fasteners and withdrawing the panel to the extent of the cables.

2. Diagnostic Panel

A. Equipment and Materials

R

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Torq-set driver	-

R R R R

B. Prepare

(1) Electrically isolate the panel by tripping the following circuit breakers. Fit a safety clip to each tripped circuit breaker.

	SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
R R	LH CYCLIC TIMER CONT	3-213	1H1835	B11
R	RH WING CONTN IND	15-215	H1512	B11
R R	RH WING & INT 3&4 CYCLIC IND	15-215	H1514	B12
R R	WING & INT NORM CONT & SUP	15-215	1H1836	D10
R	3CM STN PNL LTS	14-216	L86	D9

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
SUP			
LH WING & INT 1&2 CYCLIC IND	15-216	H1513	B14
LH WING CONTN IND	15-216	H1511	B15
3CM STN LH LT TEST SUP 1	15-216	L1003	C12
3CM STN LH LT TEST SUP 2	15-216	L1004	C13
RH CYCLIC TIMER CONT	15-216	2H1835	D14
WING & INT ALTN CONT & SUP	15-216	2H1836	E14

(2) Gain access to the panel by removing the guard rail; use the Torq-set driver to remove the securing screws.

C. Remove

(1) Release the four quick-release fasteners and withdraw the unit to gain access to the electrical connectors.

(2) Disconnect the four electrical connectors located at the rear of the panel. Remove the panel.

(3) If a replacement panel is not immediately available, refit the guard rail.

D. Install

(1) Comply with the electrical safety precautions.

(2) Remove the guard rail, if refitted in operation 2.C.(3).

(3) Support the unit and connect the electrical connectors, ensuring that the mating surfaces are clean and undamaged.

R (4) Refit the diagnostic panel; avoid trapping the cable assemblies.

R (5) Secure the panel with the four quick-release fasteners.

R (6) Check that the panel is bonded in accordance with 20-27-11.

E. Conclusion

(1) Reset the circuit breakers tripped before removal.

R (2) Position the guard rail and, using the Torq-set
R driver, secure it with the attachment screws.

R (3) Check the panel lighting as detailed in 33-16-00.

R (4) Carry out Operational Tests of the left and right cyclic and continuous de-icing systems, as detailed in 30-11-00.

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THREE-PHASE CURRENT TRANSFORMER - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

The three-phase current transformers are mounted one on panel 24-215 and one on panel 24-216, at the aft end of the flight compartment racking.

Each transformer provides signals for the associated LH or RH wing and intake de-icing system.

2. Transformer

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner, 119 to 131 lbf in (1.35 to 1.48 mdaN)	-
Torque spanner, 21 to 24 lbf in (0.240 to 0.276 mdaN)	-
Torque spanner, 12 to 14 lbf in (0.137 to 0.160 mdaN)	ULTRA-WB808-6UNC

B. Prepare

(1) Gain access to panel 24-215 by removing the service trolleys stowed under the galley working surface and, if necessary, dismantle the galley structure as detailed in Chapter 25. Release the 'quick-thread' studs in the lower access panel and remove the panel.

R (2) Gain access to panel 24-216 by removing the furnished bulkhead as detailed in 25-23-11, Removal/Installation.

(3) Isolate the electrical generation and external power supplies as detailed in 24-00-00, Servicing.

C. Remove

(1) Identify the transformer, equipment identification reference 1H1840(2H1840).

(2) Remove the cover from the transformer terminal block then disconnect the electrical cables from the terminal block.

(3) Release the busbars running through the transformer core holes by disconnection at the adjacent contactors.

(4) Remove the mounting screws and washers, and withdraw the transformer.

D. Install

(1) Comply with the electrical safety precautions.

(2) Pass the busbars through the respective A, B and C transformer core holes, then place the transformer on its mounting base with the hole marked A uppermost. Secure the transformer with the screws and washers, then ensure that it is bonded in accordance with 20-27-11.

R CAUTION: THE ASSEMBLY ORDER OF BUSBAR/CABLES TO A TERMINAL POST MUST BE BUSBAR FIRST, IF FITTED, FOLLOWED BY CABLES IN SIZE ORDER WITH THE LARGEST CABLE FIRST.

(3) Connect the busbars to the adjacent connectors, ensuring that the connections are made in accordance with the cable identifications and the
R applicable wiring diagram:-

R (a) Assemble the nuts and washers to the terminal
R posts of the contactors to the left and right
R of the current transformer in the order given
R below:-

R a1) Left-side contactor terminal post:

R Thick washer, thin washer, spring washer,
R nut.

R a2) Right-side contactor terminal post:

R Thin washer, spring washer, nut.

R (b) Torque-tighten the terminal nuts to between
R 119 and 131 lbf in (1.35 and 1.48 mdaN).

(4) Connect the electrical cables to the transformer terminal block, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram. Torque-tighten the three 6 UNC terminal nuts to between 12 and 14 lbf in (0.137 and 0.160 mdaN), and the one 8 UNC terminal nut to between 21 and 24 lbf in (0.240 and 0.276 mdaN).

(5) Fit the unit terminal block cover and secure it with the screws and washers.

E. Conclusion

(1) Cancel the electrical safety precautions taken before removal.

R (2) Carry out an Operational Test of the associated
R left or right cyclic de-icing system (Ref.
R 30-11-00, Adjustment/Test).

(3) On panel 24-215, fit the access panel and secure it with the 'quick-thread' studs. If necessary, reassemble the galley structure as detailed in Chapter 25. Stow the servicing trolleys under the galley working surface.

R (4) Fit the furnished bulkhead over panel 24-216 as
R detailed in 25-23-11, Removal/Installation.

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EARTH CURRENT TRANSFORMER - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

The LH and RH earth current transformers are mounted underneath the cabin floor in zones 125 and 126 respectively. De-icing power cables, which pass into zones 131 and 132, have to be released to free the transformers.

Each transformer supplies signals to the associated LH and RH wing and intake de-icing system.

Throughout the operations, equipment identifications are provided unbracketed for the left system and bracketed for the right system.

2. Transformer

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner, 60 to 70 lbf in (0.69 to 0.80 mdaN)	-
Torque spanner, 21 to 24 lbf in (0.240 to 0.276 mdaN)	-
Torque spanner, 12 to 15 lbf in (0.137 to 0.170 mdaN)	-
Torque spanner, 12 to 14 lbf in (0.137 to 0.160 mdaN)	ULTRA-WB808-6UNC

B. Prepare

(1) Isolate the electrical generation and external power supplies as detailed in 24-00-00, Servicing.

(2) Remove baggage compartment sidewall panels 131 FS and 131 KS (132 FS and 132KS).

(3) Disconnect the bonding leads of panels 2-131 and 3-131 (2-132 and 3-132) at the aircraft structure by removing the nuts, washers and bolts.

CAUTION: CARE MUST BE TAKEN NOT TO PUT UNDUE STRAIN ON AIRCRAFT CABLE LOOMS.

(4) Partially remove panels 2-131 and 3-131 (2-132 and 3-132) by supporting the panel and remove the (four) mounting nuts, washers, spacers and bolts. Note the order of assembly.

(5) Remove cabin floor panel 221 AA (222 AA) to gain access to the transformer.

C. Remove

(1) Identify the transformer, equipment identification reference 1H1841 (2H1841).

(2) Remove the cover from the transformer terminal block, then disconnect the electrical cables from the terminal block.

(3) Remove the transformer mounting screws and washers.

(4) Free the transformer from the de-icing power cables by:

(a) removing the P-clip from the cables on the forward side of the transformer mounting bracket,

(b) removing all the P-clips and cable ties from the cables aft of the transformer to panel 2-131 (2-132), and

(c) removing the cover from terminal block UG1189, panel 2-131 (UG1200, panel 2-132), and disconnecting the power cables from the terminal block.

(5) Free the cable that passes through the current transformer on the reverse side of panel 2-131 (2-132).

(6) Withdraw the transformer along the power cables.

(7) If the transformer is not to be renewed immediately, reconnect the cables to the appropriate terminal block, ensuring that the connections are made in accordance with the cable terminations and the applicable wiring diagram.

D. Install

(1) Comply with the electrical safety precautions.

(2) Disconnect the appropriate de-icing power cables from the terminal block, if refitted after removal.

(3) Pass the transformer along the power cable and secure it with the screws and washers. Ensure that the transformer is bonded in accordance with 20-27-11.

CAUTION: THE ASSEMBLY ORDER OF BUSBAR/CABLES TO A TERMINAL POST MUST BE BUSBAR FIRST, IF FITTED, FOLLOWED BY CABLES IN SIZE ORDER WITH THE LARGEST CABLE FIRST.

(4) Refer to the Wiring Diagram Manual and pass the appropriate cable through the current transformer on the reverse side of panel 2-131 (2-132), equipment identification reference 1H2038 (2H2038).

(5) Connect the power cables to the appropriate terminal block, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram. Torque-tighten the terminal nuts to between 60 and 70 lbf in (0.69 and 0.80 mdaN), then refit the terminal block cover and secure it with the screws and washers.

(6) Refit the P-clips and cable ties to the cables; ensure that the power cables are positioned in the centre of the transformer core hole and without strain at the terminal block.

(7) Connect the electrical cables to the transformer terminal block, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram. Torque-tighten the 6 UNC terminal nut to between 12 and 14 lbf in (0.137 and 0.160 mdaN), and the 8 UNC terminal nut to between 21 and 24 lbf in (0.240 and 0.276 mdaN).

(8) Fit the transformer terminal block cover and secure it with the screws and washers.

(9) Secure panels 2-131 and 3-131 (2-132 and 3-132) with the bolts, spacers, washers and nuts, assembling in the order noted previously. Torque-tighten the nuts to between 12 and 15 lbf in (0.137

and 0.170 mdaN).

(10) Attach the panel bonding leads with the bolts, washers and nuts; check that the bonding is in accordance with 20-27-11.

E. Conclusion

(1) Cancel the electrical safety precautions taken before removal.

(2) Carry out an Operational Test of the transformer (Ref. Adjustment/Test).

(3) Refit the cabin floor panel as detailed in 53-21-21.

(4) Refit the baggage compartment sidewall panels.

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EARTH-CURRENT TRANSFORMER - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

It is not possible to check the operation of an earth-current transformer in situ. For this reason, it is assumed that a fully tested, serviceable transformer has been installed. In the following Operational Test, therefore, a test set is used merely to determine that the transformer is correctly connected into the system.

The test set utilizes a system power supply and is connected by test looms to the associated left or right cyclic timer and protection unit (CTPU), in the underfloor baggage compartment.

Throughout the procedures, electrical equipment identifiers are provided unbracketed for the left transformer and bracketed for the right transformer.

Functional and System Tests are not applicable.

2. Operational Test

A. Equipment and Materials

DESCRIPTION	PART NO.
De-icing system test set	TE6063000
Circuit breaker safety clips	-

R B. Prepare (Ref. Fig.501 and 502)

R (1) Isolate the electrical generation and external power supplies as detailed in 24-00-00, Servicing.

R R (2) For the left transformer only, gain access to panel 24-215 by dismantling the galley structure as detailed in Chapter 25-31-00, Removal/Installation. Release the 'quick-thread' studs in the lower access panel and remove the panel.

R (3) For the right transformer only, gain access to panel 24-216 by removing the furnished bulkhead as

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R detailed in 25-24-31, Removal/Installation.

(4) At panel 24-215 (24-216), identify the system three-phase contactor, electrical identification reference
R 1H1843 (2H1843) (Ref. Fig. 501).

(5) Remove connector 1H1843-A (2H1843-A) from the three-phase contactor and insulate it from the adjacent
R busbars.

R (6) Gain access to the left and right CTPUs, electrical identification references 1H1839 and 2H1839, by removing the appropriate sidewall panels in the underfloor baggage compartment.

R (7) Remove connectors 1H1839-B and 2H1839-B from the CTPUs.

Control Panel

CAUTION: TEST LOOM 3 MUST REMAIN DISCONNECTED.

R (8) Using the test looms provided, connect sockets 1 and 2 of the test set to CTPU sockets 1H1839-D and 1H1839-B (2H1839-D and 2H1839-B) respectively
R (Ref. Fig. 503).

R (9) Ensure that all the toggle switches on the test set are in the 'down' position, e.g., 'off', 'normal', 'run'.

R (10) Trip and fit a safety clip to circuit breaker RH CYCLIC TIMER CONT, 2H1835, panel 15-216, map ref.D14 (LH CYCLIC TIMER CONT, 1H1835, panel 3-213, map ref.B11).

R (11) Trip and fit safety clips to all the following circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
RH WING & INT 3 & 4 CYCLIC IND	15-215	H1514	B12
WING & INT NORM CONT & SUP	15-215	1H1836	D10
LH WING NORM CONTN CONT	15-215	1H1833	F10
LH WING ALTN CONTN CONT	15-215	1H1834	F11

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH CYCLIC NORM CONT	15-215	1H1827	F12
LH CYCLIC ALTN CONT	15-215	1H1828	F13
LH WING & INT 1 & 2 CYCLIC IND	15-216	H1513	B14
WING & INT ALTN CONT & SUP	15-216	2H1836	E14
RH WING NORM CONTN CONT	15-216	2H1833	F16
RH WING ALTN CONTN CONT	15-216	2H1834	F17
RH CYCLIC NORM CONT	15-216	2H1827	F18
RH CYCLIC ALTN CONT	15-216	2H1828	F19

(12) Restore the electrical generation and external power supplies as detailed in 24-00-00, Servicing.

(13) Make available electrical ground power as detailed in 24-41-00.

(14) On flight compartment roof panel 4-211, set the WING & INTAKE ANTI-ICING - MAIN selector switch to the "4 SECS - ON" position (Ref. Fig. 502).

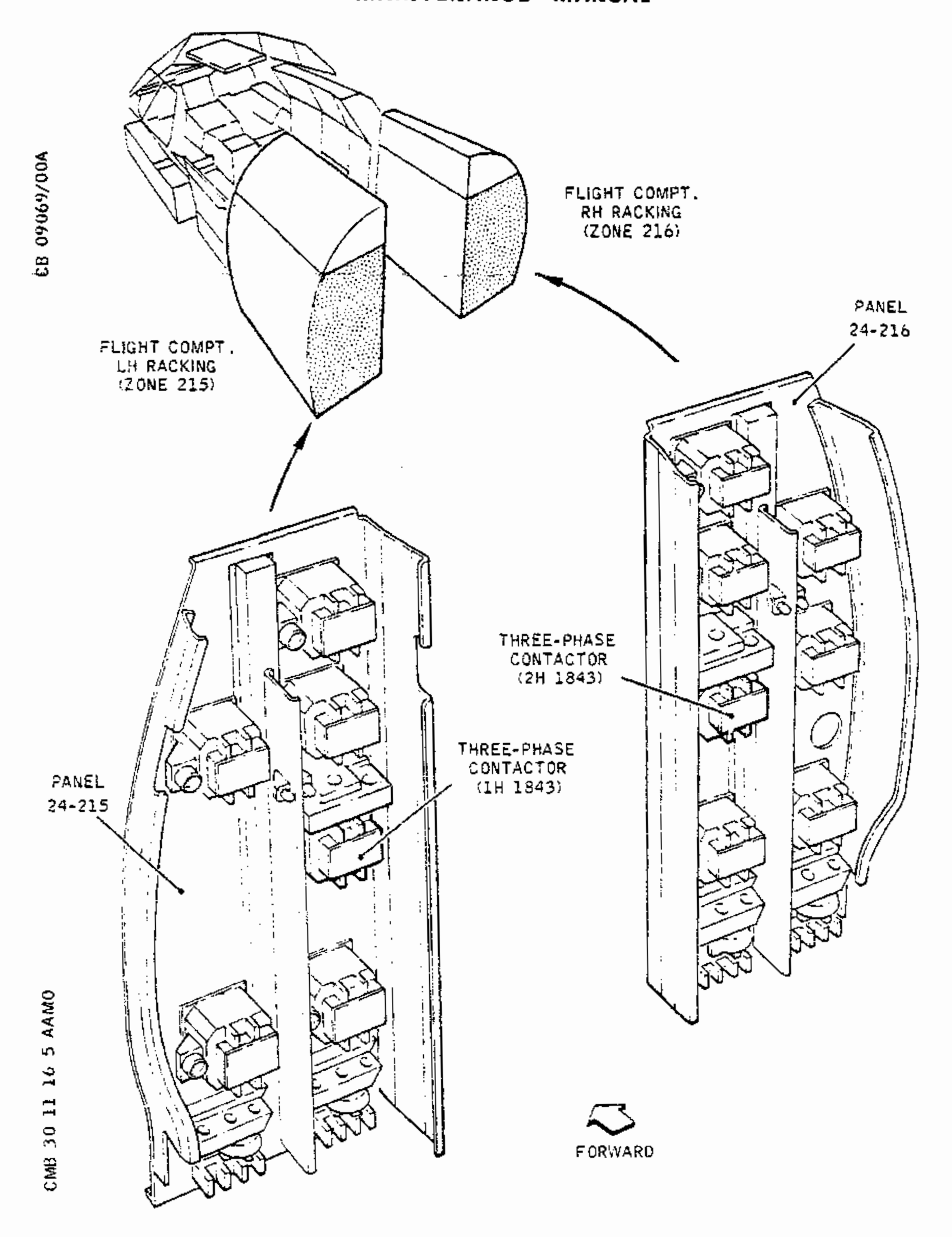
C. Test

NOTE: All the controls and annunciators in this test are
R located on the front panel of the test set. Unless
R instructed otherwise, disregard the test set FAULT
R ANNUNCIATORS in the following tests.

(1) Set the left-hand and centre CYCLIC CONTROL switches to the "NORM CYC" and "ISOL" positions respectively.

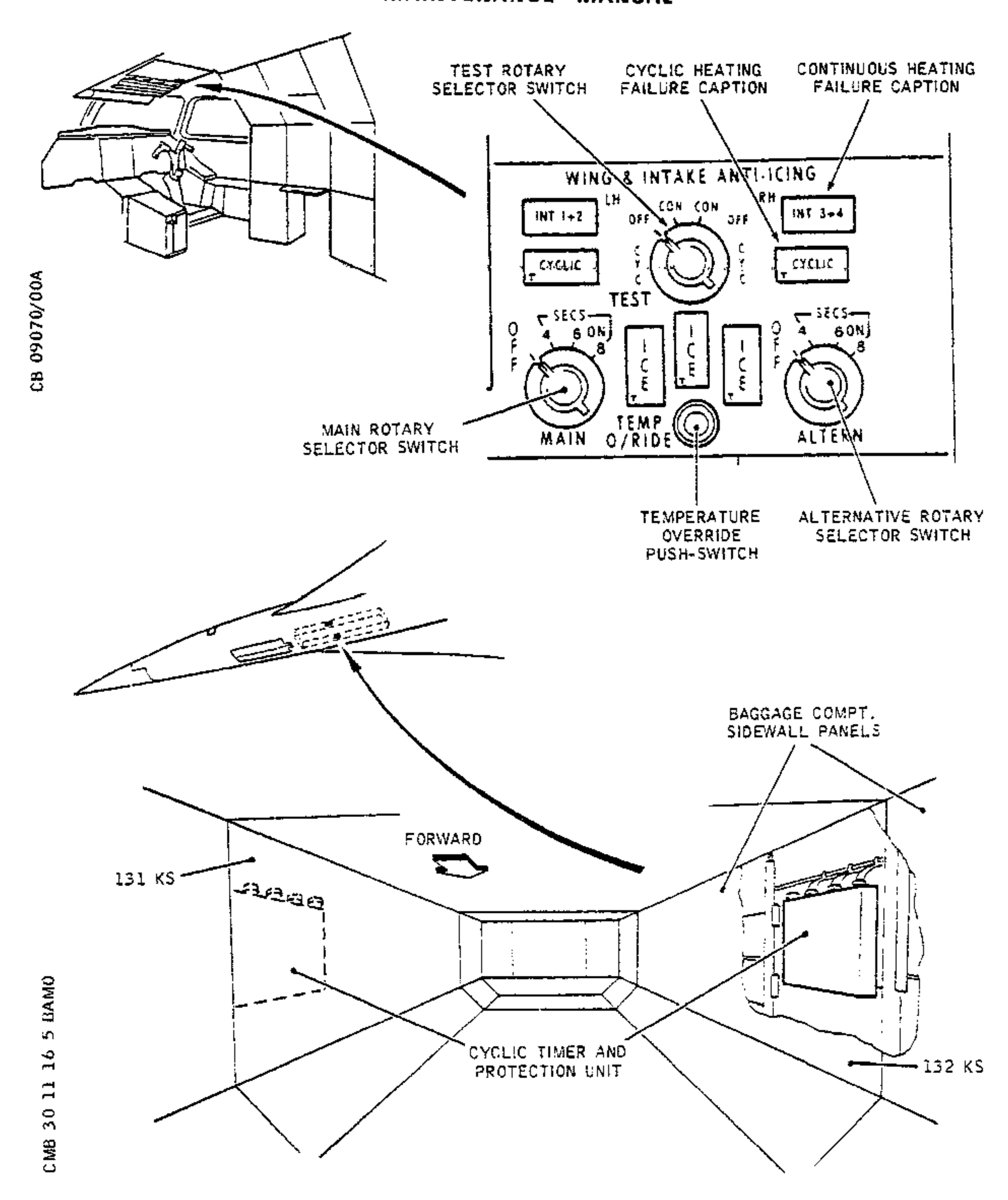
(2) Set the three CURRENT INHIBIT switches to the "INHIBIT" position.

(3) Set the DC CURRENT SIMULATORS - SIM E switch to the "ON" position.



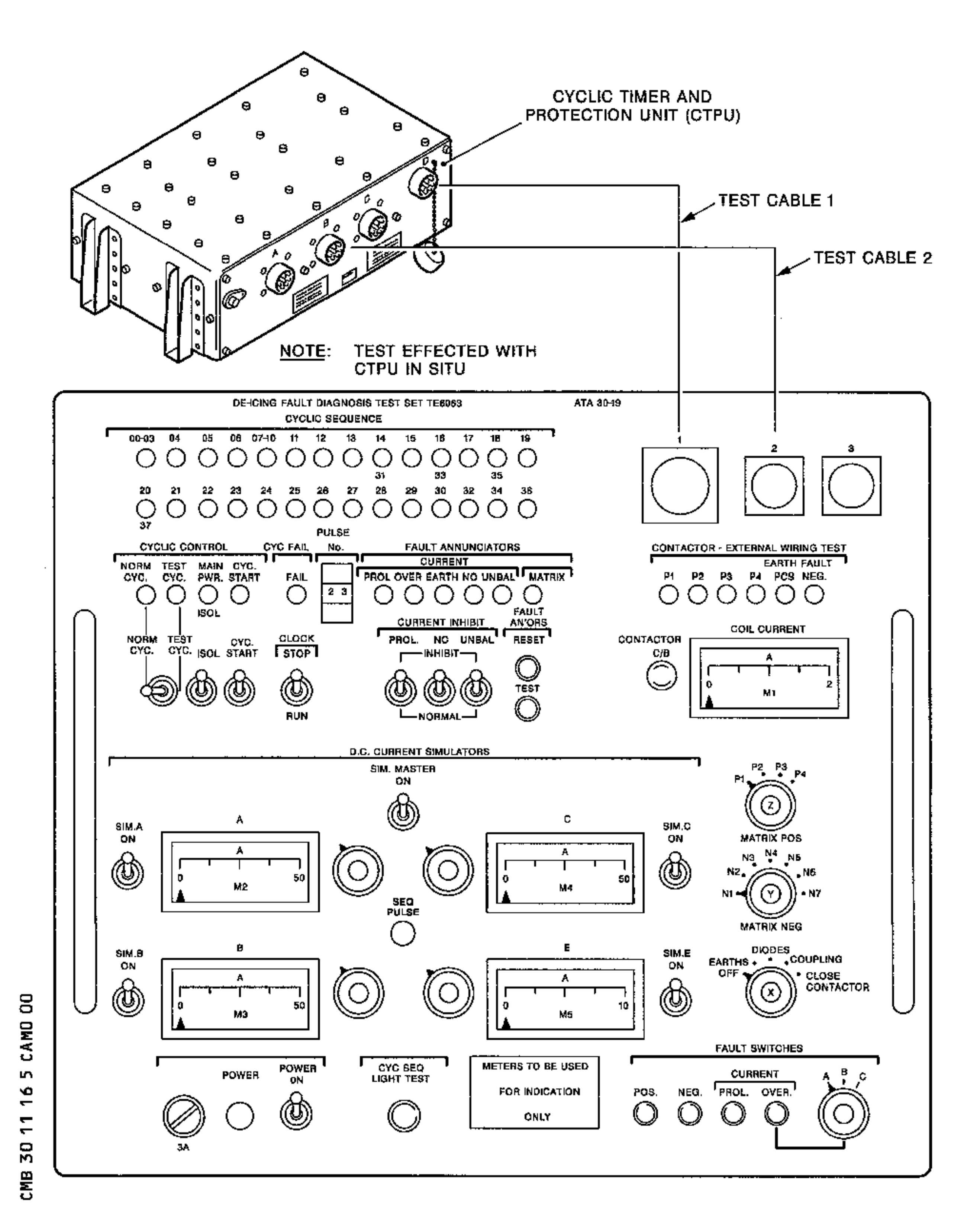
R

Three-phase Contactors - Location
Figure 501



Cylic Timer and Protection Units (CTPU's)
- Location also Wing and Intake Anti-icing!
Figure 502

R



CMB 30 11 16 5 CAMD 00

De-icing Fault Diagnostic Test Set TE6063000
Figure 503

R

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(4) Set the POWER switch to the "ON" position and check that the red POWER annunciator is illuminated.

(5) Initiate a normal cyclic sequence by setting the right-hand CYCLIC CONTROL switch to the "CYC START" position. Check that -

(a) the green NORM CYC, MAIN PWR ISOL and CYC START annunciators are illuminated,

(b) the PULSE NUMBER counters are reset to station 00, by a train of reset pulses, and then start counting at approximately 4 s intervals, and

(c) the green SEQ PULSE and appropriately numbered red annunciators cycle on-off in unison with the counter operation, e.g., when the counters indicate station 05, both the green SEQ PULSE and red annunciator 05 are illuminated.

NOTE: At stations 20 and 37 (blank pulses), the green and red sequence annunciators will not be illuminated.

(6) Set the CLOCK switch to the "STOP" position with the counters and red sequence annunciator at any station other than 04, 11, 20 or 37, and check that the cyclic sequence is stopped, i.e., the counters stop counting and the green and red sequence annunciators remain illuminated.

(7) Ensure that DC CURRENT SIMULATORS knob E is in the fully counter-clockwise position, then set the SIM MASTER switch to the "ON" position.

(8) Slowly rotate knob E to increase the reading on meter E. Check that an earth-current fault condition is indicated between 2 and 4 A, as follows:-

(a) The green and red sequence annunciators are extinguished, and

R (b) The amber FAIL annunicator is illuminated.

NOTE: If the meter reading is below 2 A when the fault condition is indicated, it can be assumed that the earth-current transformer connections are not made.

(9) If a subsequent check of the earth-current fault condition is required, return the SIM MASTER switch to the 'off' position, press and release the FAULT AN'ORS - RESET switch, set the CLOCK switch to the "RUN" position and repeat operations (6), (7) and (8).

(10) Return the POWER switch to the 'off' position.

D. Conclusion

(1) Isolate the electrical generation and external power supplies as detailed in 24-00-00, Servicing.

(2) Disconnect the two test looms from the CTPU and test set.

(3) Ensure that the mating surfaces are clean and undamaged and reconnect the electrical connectors 1H1839-B and 2H1839-B to the respective CTPUs.

(4) Refit the baggage compartment sidewall panels.

(5) Remove all test equipment and tools from the baggage compartment.

(6) At panel 24-215 (24-216), identify the system three-phase contactor, electrical identification reference 1H1843 (2H1843).

(7) Ensure that the mating surfaces are clean and undamaged and reconnect the connector 1H1843-A (2H1843-A) to the three-phase connector.

(8) For the left transformer only, fit the access panel to panel 24-215 and secure it with the 'quick-thread' studs. If necessary, reassemble the galley
R structure as detailed in Chapter 25-31-00, Removal/
R Installation.

(9) For the right transformer only, fit the furnished bulkhead over panel 24-216 as detailed in 25-24-31, Removal/Installation.

R (10) Restore the electrical generation and external power
R supplies as detailed in 24-00-00, Servicing.

R (11) On flight compartment roof panel 4-211, return the WING & INTAKE ANTI-ICING - MAIN selector switch to the "OFF" position.

R (12) Reset all the circuit breakers tripped during preparation for test (Ref. para.2.B).

R (13) Carry out an Operational Test of both the left and right cyclic de-icing systems (Ref. 30-11-00, Adjustment/Test).

SINGLE PHASE CURRENT TRANSFORMER - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

The single-phase current transformers are mounted one each on the reverse side of contactor panels 2-131 and 2-132, in the underfloor baggage compartment. The panels have to be partially removed to gain access.

Each transformer supplies signals to the associated LH or RH wing and intake de-icing system.

2. Transformer

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner, 60 to 70 lbf in (0.69 to 0.80 mdaN)	-
Torque spanner, 21 to 24 lbf in (0.240 t0 0.276 mdaN)	-
Torque spanner, 12 to 15 lbf in (0.137 to 0.170 mdaN)	-
Torque spanner, 12 to 14 lbf in (0.137 to 0.170 mdaN)	ULTRA-WB808-6UNC

B. Prepare

(1) Remove the appropriate baggage compartment sidewall panel.

(2) Isolate the electrical generation and external power supplies as detailed in 24-00-00, Servicing.

(3) At panel 2-131 or 2-132, as appropriate, remove the nuts, washers and bolts securing the two bonding leads to the aircraft structure.

CAUTION: CARE MUST BE TAKEN NOT TO PUT UNDUE STRAIN ON AIRCRAFT CABLE LOOMS.

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(4) Gain access to the transformer by supporting the panel and removing the four mounting nuts, washers, spacers and bolts; note the order of assembly.

C. Remove

(1) Identify the transformer, equipment identification reference 1H2038(2H2038).

(2) ~~Free the LH transformer from the power cable by -~~

(a) removing the cover from terminal block UG1189 on the panel,

(b) disconnecting the appropriate power cable from the terminal block, and

(c) removing the appropriate P-clips and cable ties from the cable.

(3) Free the RH transformer from the power cable by -

(a) removing the cover from terminal block UG1200 on the panel,

(b) disconnecting the appropriate power cable from the terminal block, and

(c) removing the appropriate P-clips and cable ties from the cable.

(4) Remove the cover from the transformer terminal block, then disconnect the electrical cables from the terminal block.

(5) Remove the mounting screws and washers, then withdraw the transformer.

(6) If the transformer is not to be replaced immediately, reconnect the power cable to the appropriate terminal block, ensuring that the connection is made in accordance with the cable identification and the applicable wiring diagram.

D. Install

(1) Comply with the electrical safety precautions.

(2) Disconnect the appropriate de-icing power cable from the terminal block, if refitted after removal.

(3) Pass the transformer along the power cable and secure it with the screws and washers. Ensure that the transformer is bonded in accordance with 20-27-11.

<u>CAUTION</u>: THE ASSEMBLY ORDER OF BUSBAR/CABLES TO A TERMINAL POST MUST BE BUSBAR FIRST, IF FITTED, FOLLOWED BY CABLES IN SIZE ORDER WITH THE LARGEST CABLE FIRST.

(4) Connect the power cable to the appropriate terminal block, ensuring that the connection is made in accordance with the cable identification and the applicable wiring diagram. Torque-tighten the terminal nut to between 60 and 70 lbf in (0.69 and 0.80 mdaN), then refit the terminal block cover and secure it with the screws and washers.

(5) Connect the electrical cables to the transformer terminal block, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram. Torque-tighten the 6 UNC terminal nut to between 12 and 14 lbf in (0.137 and 0.160 mdaN), and the 8 UNC terminal nut to between 21 and 24 lbf in (0.240 and 0.276 mdaN).

(6) Refit the P-clips and cable ties to the cables; ensure that the power cable is positioned in the centre of the transformer core hole.

(7) Fit the transformer terminal block cover and secure it with the screws and washers.

(8) Secure the panel with the bolts, spacers, washers and nuts, assembling in the order noted previously. Torque-tighten the bolts to between 12 and 15 lbf in (0.137 and 0.170 mdaN).

(9) Attach the panel bonding leads with the bolts, washers and nuts. Check that the bonding is in accordance with 20-27-11.

E. Conclusion

(1) Cancel the electrical safety precautions taken before removal.

R (2) Carry out an Operational Test of the associated
R left or right cyclic de-icing system (Ref.
R 30-11-00, Adjustment/Test).

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(3) Refit the baggage compartment sidewall panel.

WING DE-ICING SUPPLY AND INSTALLATION - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)

The wing leading edges, from the wing roots to outboard of the engine intakes, are provided with electrical de-icing elements, to protect the engines from the ingestion of large particles of ice shed during flight. De-icing controls the shedding in such a way that ice particles entering the engines are limited to an acceptable size.

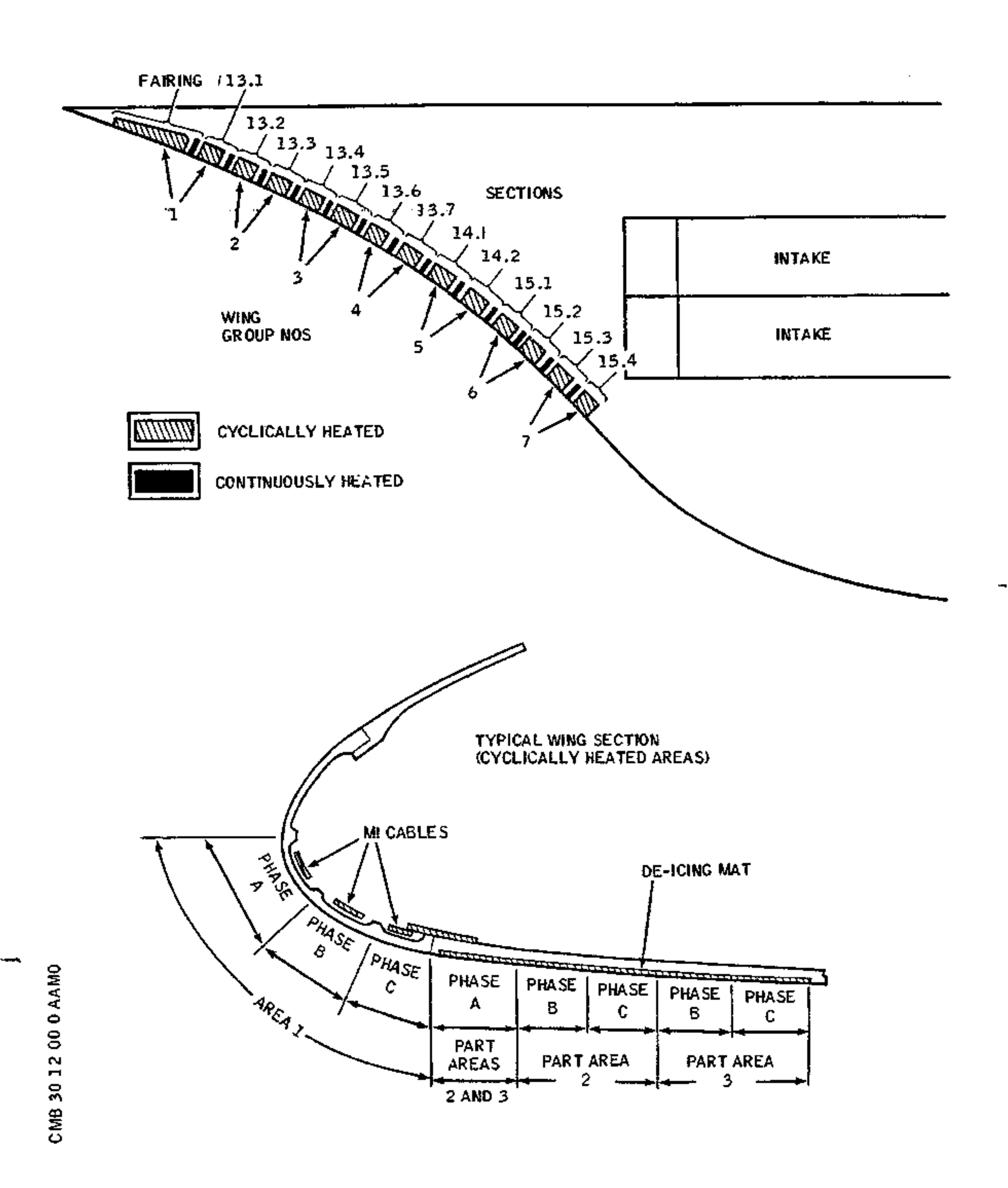
To achieve controlled ice shedding, the de-iced portion of each wing has fourteen relatively large, cyclically de-iced areas which are separated by thirteen small, continuously de-iced areas. The continuously de-iced areas located between the cyclically de-iced areas are known as 'breaker strips'. From the wing root, all the de-icing elements in each cyclically de-iced area and its succeeding breaker strip are installed on, and identified by, detachable portions of the leading edge, namely, a fairing and thirteen numbered sections (Ref. Chap.57). The outermost section (15.4) does not contain a breaker strip.

De-icing elements are in the form of de-icing mats and mineral-insulated (MI) cables, of which only the mats are visible externally. On the fairings the de-icing extends from the top surface to the bottom surface, but on the sections it extends only from the mid-point of the leading edge to the bottom surface.

The cyclically de-iced area on each fairing consists of one large wrap-around de-icing mat, and that on the sections a flat mat on the lower surface and MI cables between the mat and the mid-point of the leading edge. The elements in both types of heater are interconnected to provide seventeen cyclic de-icing loads in each wing. With the system operating or under test, each load is applied, in turn, for a selected period one or more times in a cyclic sequence. Switching of the power supplies for the loads is carried out by wing cyclic heating contactors, which are energized by pulses from a cyclic timer and protection unit (Ref. 30-11-00).

The line of de-icing mat on the right fairing is broken by a water charging compartment (Ref. 38-11-15). This compartment reduces the area of de-icing mat, and causes the fairing to have one element less than the left fairing.

Cyclic de-icing mats and MI cables in each wing are installed in designated areas of seven electrical wing groups. The



Wing De-icing - Element Location
Figure 001

groups are formed by interconnecting the elements in the fairing and the adjacent section, and each subsequent pair of sections. MI cables are installed in wing group area 1, and de-icing mats in wing group areas 2 and 3. Areas 1 and 2 are provided on all wing groups, but area 3 is only provided on wing groups 5 to 7. Each area represents a load switched by a contactor.

Each continuously de-iced breaker strip is provided with a single element in the form of a MI cable. The thirteen elements in each wing are interconnected to form six continuous de-icing loads. Power is applied to all of these loads whenever the system is operating or, for a limited period only, when the system is tested. Switching of the power supplies for the loads is carried out by continuous heating control relays, which are energized by control or test selection supplies (Ref. 30-11-00).

2. De-icing Mats

De-icing mats are of sandwich construction, and are connected to the cyclically controlled power supplies by low-resistance wire terminations to ensure moderate temperatures in the terminal areas. The sandwich is bonded to the appropriate structure and consists of an adhesive layer, an inner insulation layer, a metal-sprayed heating element, an outer insulation layer and a hard, black protective finish. Terminal posts are soldered to the heating elements and appear as small humps on the protective finish. To ensure satisfactory dispersal of static electricity, the protective finish is of a conducting material.

On the fairings, the multiple curvature of the mats dictates the use of type 3A mats, which are built-up direct onto the surface of the fairing during manufacture. The mats on the sections are flat, and type 3 mats are used. These mats are preformed and bonded into a recess on the bottom surface of each section.

3. Mineral-insulated Cables

MI cables are of very small diameter and consist of a conductor held concentrically in a metal sheath by a mineral insulant. Low-resistance wire terminations are provided to ensure moderate temperatures in the terminal areas.

Cyclic de-icing MI cables have a centre conductor with a low temperature coefficient of resistance, and are bonded into grooves on the inside of the forward lower leading edge.

Continuous de-icing MI cables have a centre conductor with a relatively high temperature coefficient of resistance, and are bonded into grooves in cable carriers (flanges) located on the outboard edge of the fairings and sections.

4. Operation (Ref. Fig.002 and 003)

A. Control and Indication

~~Control and indication of the wing leading edge de-icing~~ is described in 30-11-00.

B. Functional Description

(1) Cyclic De-icing

Cyclic de-icing is effected by applying power to each cyclic de-icing load in turn for a selected period.

The power supplies for the cyclic de-icing loads in each wing are taken direct from a main a.c. busbar, and are routed through a three-phase contactor and seventeen wing cyclic heating contactors. Circuit breakers are not provided. However, if certain high-risk current conditions occur, isolation is rapidly achieved by the automatic de-energization and locking out of the three-phase contactor. Each wing cyclic heating contactor is energized by programmed output pulses from a cyclic timer and protection unit.

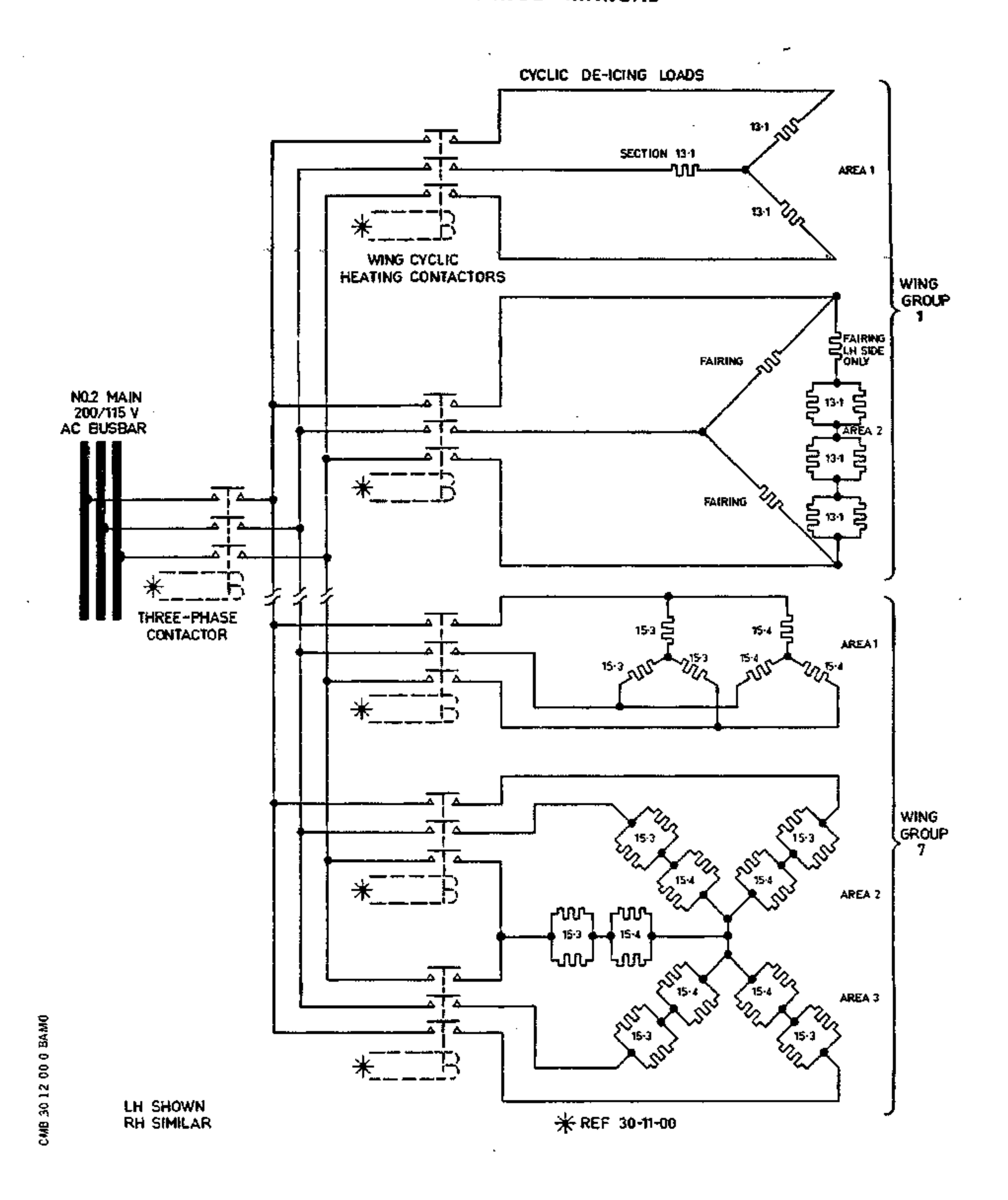
(2) Continuous De-icing

Continuous de-icing is effected by applying power to all the continuous de-icing loads.

The power supplies for the continuous de-icing loads in each wing are taken from a main a.c. busbar, and
R are routed through three continuous heating control relays and six a.c. current sensors.
All the relays are energized whenever the system is operating and also, for a limited period only, when the system is tested. Each sensor illuminates an associated failure warning caption if the current flow in the load falls below a certain level.

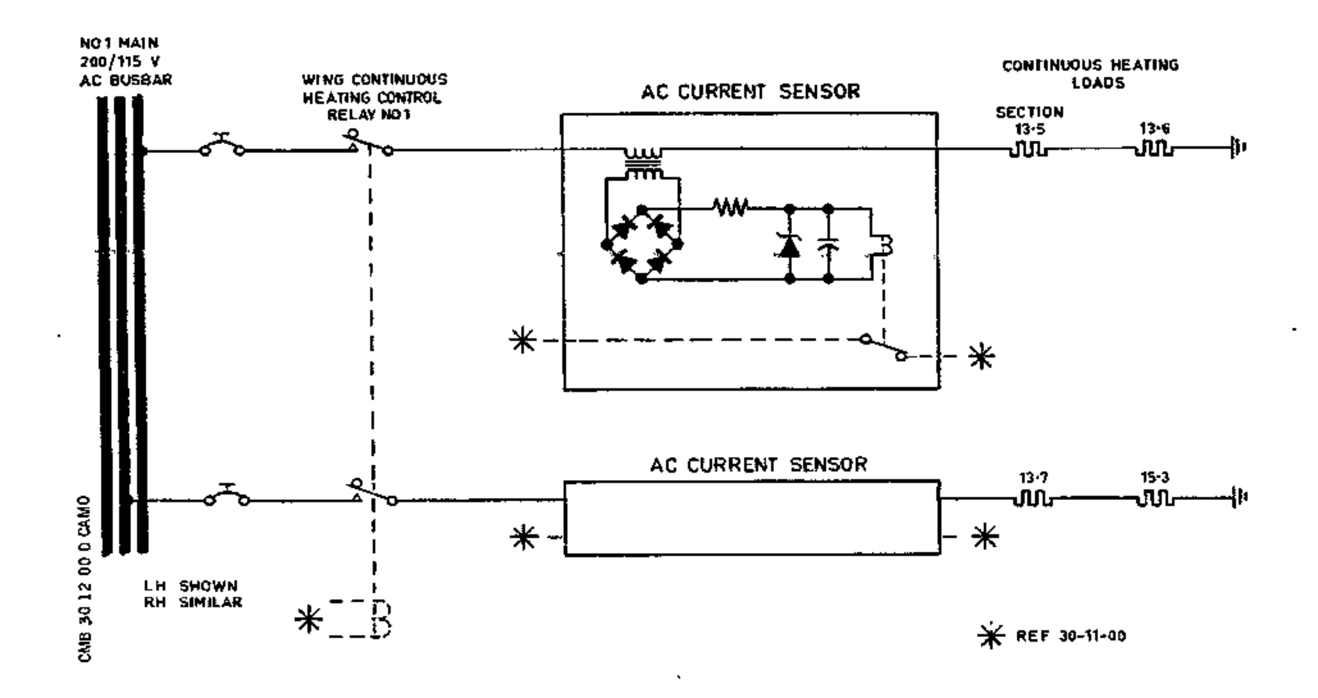
C. Electrical Power Supplies

Electrical power is supplied from the busbars listed in Table 1. It should be noted that the cyclic de-icing



Typical Wing Cyclic De-icing Loads -
Simplified Schematic
Figure 002

R



- Typical Wing Continuous De-icing Loads -
Simplified Schematic
Figure 003

R

supplies are also applied to loads in the engine intakes (Ref. 30-21-00).

SERVICE	BUSBAR	CIRCUIT BREAKER PANEL
Left wing and intakes, cyclic heaters	No.2 main 200/115 V a.c.	-
Left continuous heaters	No.1 main 115 V a.c.	14-215
Right wing and intakes, cyclic heaters	No.3 main 200/115 V a.c.	-
Right continuous heaters	No.4 main 115 V a.c.	14-216

SERVICE	BUSBAR	CIRCUIT BREAKER PANEL

Table 1

5. System Management

System management of the wing leading edge de-icing is described in 30-11-00.

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WING DE-ICING SUPPLY AND INSTALLATION - INSPECTION/CHECK

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

CAUTION: IF AN "INT 1 & 2", "INT 3 & 4" or "CYCLIC" CAPTION IS ILLUMINATED WITH THE SYSTEM SWITCHED OFF, ISOLATE THE ASSOCIATED HEATING POWER SUPPLIES IMMEDIATELY (REF. 30-11-00, ADJUSTMENT/TEST).

1. General

The de-icing installation on each wing consists of mineral-insulated (MI) cables and de-icing mats, and extends from the wing root fairing to outboard of the engine intakes.

Unlike the de-icing mats, the MI cables are not visible externally, therefore this topic applies only to the de-icing mats. The mats are black and separated into thirteen rectangular sections on the underside of each wing leading edge, and one larger section wrapped around each wing root fairing.

2. Inspection

A. Prepare

(1) Ensure that the MAIN, ALTERN and TEST selector switches on the WING AND INTAKE ANTI-ICING portion of flight compartment roof panel 4-211 are set to an OFF position.

(2) Place a notice on the flight compartment centre console, warning that the system is being worked on.

B. Inspect

(1) Inspect the black protective finish of each de-icing mat for freedom from -

(a) charred patches, blisters and localized discolouration,

(b) scratches, cracks and chips, and

(c) excessive erosion, which would be indicated by exposure of the red-brown outer insulation layer.

C. Conclusion

(1) Remove the warning notice from the flight compartment centre console.

WING DE-ICING SUPPLY AND INSTALLATION - APPROVED REPAIRS

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

FUMES FROM CLEANING SOLVENTS ARE TOXIC, ENSURE THAT THE WORKING AREA IS FREELY VENTILATED.

CAUTION: DO NOT USE THE DE-ICING MAT HEATING ELEMENTS AS A HEAT SOURCE TO CURE REPAIR MATERIALS.

1. General

Repair procedures in this topic apply only to the de-icing mat protective finish and outer insulation, and are of a limited nature. An assessment procedure, which includes an insulation resistance (IR) test, is used to determine whether or not the outer insulation needs repairing. However, repairs to the outer insulation are limited to areas of low insulation resistance which measure not more than 0.157 in (4 mm) across when cut back and bevelled for repair.

Damage to the heating elements and/or the inner insulation, which may or may not be visually obvious, or indicated at system level, are outside the scope of this topic. If such faults exist, the repairs detailed in this topic must not be carried out. It is assumed that faults in the heating elements would be confirmed by appropriate continuity checks, and faults to the inner insulation by an insulation resistance test between the elements and aircraft earth, provided any loose protective finish were first removed from the damaged area.

The repair to the protective finish can be accomplished in one stage or, if aircraft time on the ground is limited, in two shorter stages. The approximate times required are:

(1) Assessment: 25 min.

(2) Repair to outer insulation (if necessary): 1 h.

(3) Repair to protective finish: 9 h 30 min, or two periods of 1 h 30 min.

2. Damage Assessment

A. Equipment and Materials

DESCRIPTION	PART NO.
Emery paper, 240 grit	-
The above item is available in a repair kit, Part No. NB0075/957	
250 V insulation resistance tester	-
250 W infra-red lamp	-
Kimwipe wipers or lint-free cloth	-
General purpose cleaning solvent BAC M302	ICI850/1012
Alternatives to the above solvent are:	
(a) Carbon tetrachloride	-
(b) Trichloroethane ('Genklene')	-

B. Prepare to Assess Damage

(1) Ensure that the selector switches on the wing and intake anti-icing control panel (panel 4-211) are set as follows:

(a) MAIN switch - OFF position.

(b) ALTERN switch - OFF position.

(c) TEST switch - one of the two OFF positions.

CAUTION: IF AN "INT 1 & 2", "INT 3 & 4" OR "CYLIC" CAPTION IS ILLUMINATED WITH THE SYSTEM SWITCHED OFF, ISOLATE THE ASSOCIATED HEATING POWER SUPPLIES IMMEDIATELY (REF. 30-11-00, ADJUSTMENT/TEST).

(2) Attach a placard to the anti-icing control panel, warning that the system is being worked on.

C. Assess Damage

(1) Remove any loose protective finish from the damaged area then, taking care not to damage the outer insulation, determine the extent of damage to the protective finish by gently trying to lift the broken edges with a sharp instrument.

(2) Chamfer the edges of the protective finish with the sharp instrument to the full extent of any delaminated area.

(3) Mask off the damaged area.

(4) Carefully abrade the exposed insulation with the emery paper, taking care not to damage the element, if visible, or the protective finish.

(5) Remove the swarf from the damaged area with a clean brush.

(6) Wash the damaged area with cleaning solvent, i.e., soak a Kimwipe wiper or lint-free cloth in solvent and thoroughly clean the damaged area, then immediately wipe dry with a clean Kimwipe wiper or lint-free cloth.

(7) Check the exposed outer insulation for areas of bw insulation resistance as follows:

WARNING: WHEN CARRYING OUT AN INSULATION RESISTANCE (IR) TEST, I.E., USING A WET SWAB AND IR TESTER, IT IS NECESSARY, DUE TO THE HIGH CAPACITANCE OF THE HEATING ELEMENTS, TO ENSURE THAT THE VOLTAGE POTENTIAL IS DISCHARGED TO EARTH BEFORE REMOVING ANY CONNECTIONS, ALSO, SUITABLE INSULATION MUST BE PROVIDED BETWEEN THE OPERATIVE AND AIRCRAFT EARTH.

(a) Connect the EARTH lead of the IR tester to all three power terminals on the de-icing mat side of the appropriate wing cyclic heating contactor (Ref. Wiring Diagram, 30-12-01).

(b) Attach a small moist sponge to the LINE lead of the IR tester.

(c) Operate the IR tester and explore the exposed outer insulation with the sponge. Mark any position or positions with an insulation resistance of less than 2 Mohm.

(d) Thoroughly dry the damaged area, using the infra-red lamp as necessary.

(8) If the insulation resistance over the whole of the exposed outer insulation is greater than 2 Mohm, only the protective finish requires repairing (Ref. para.4).

R (9) If the insulation resistance of any part of the outer insulation is less than 2 Mohm, the outer insulation and protective finish require repairing (Ref. para.3 and 4).

NOTE: Repairs to the outer insulation are limited to areas of low insulation resistance which measure not more than 0.157 in (4 mm) across when cut back and bevelled for repair.

3. De-icing Mat Outer Insulation Repair (Ref. Fig. 801)

A. Equipment and Materials

	DESCRIPTION	PART NO.	LUCAS AEROSPACE PART NO.
B	Resin	M527	NB12075-36
B	Hardener	M589	NB12075-37
RB	Filler Paste Type A	-	NB0075-0165
RB	Filler Paste Type B	-	NB0075-0166
	Paint brushes, e.g., 0.5 in (15 mm) wide	-	-
	Emery paper, 240 grit	-	-
	The above items are available in a repair kit, Part No. NB0075/1159		
	250 W infra-red lamp	-	-
	Thermometer with remote detector	-	-
	Kimwipe wipers or lint-free cloth	-	-

DESCRIPTION	PART NO.	LUCAS AEROSPACE PART NO.
General-purpose cleaning solvent BAC M302	ICI850/1012	-
Alternatives to the above solvent area:	-	-
(a) Carbon tetrachloride	-	-
(b) Trichloroethane ('Genklene')	-	-

B. Prepare to Repair Outer Insulation

CAUTION: USE EXTREME CARE WHEN CUTTING THE OUTER INSULATION. THE HEATING ELEMENT IS NOT FAR BELOW THE SURFACE AND IS EASILY DAMAGED.

(1) Comply with the electrical safety precautions (Ref. para.2.B.).

(2) Using a sharp instrument, cut back the outer insulation around each defective position, bevelling the material and ensuring that the width of each bevelled area does not exceed 0.157 in (4 mm).

(3) Carefully abrade the damaged area with the emery paper, taking care not to damage the element or the protective finish.

(4) Remove swarf from the damaged area with a clean brush.

(5) Wash the damaged area with cleaning solvent.

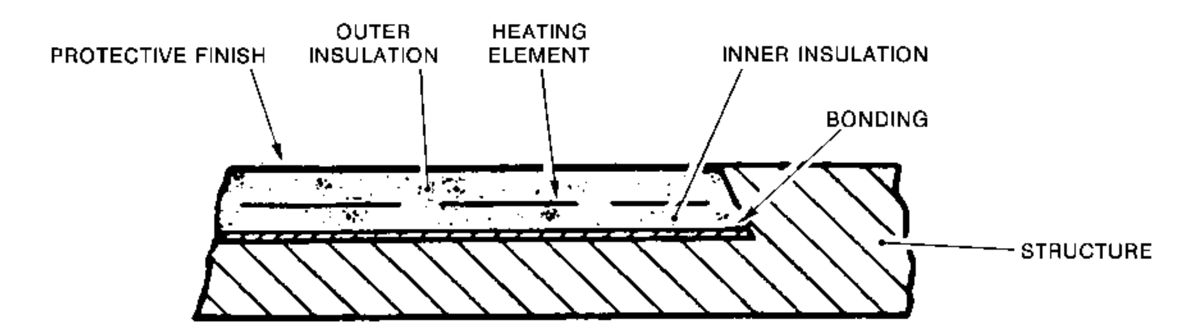
C. Repair Outer Insulation

(1) Mix Resin M527 with Hardener M589 as stated on the container (ratio 10 to 1).

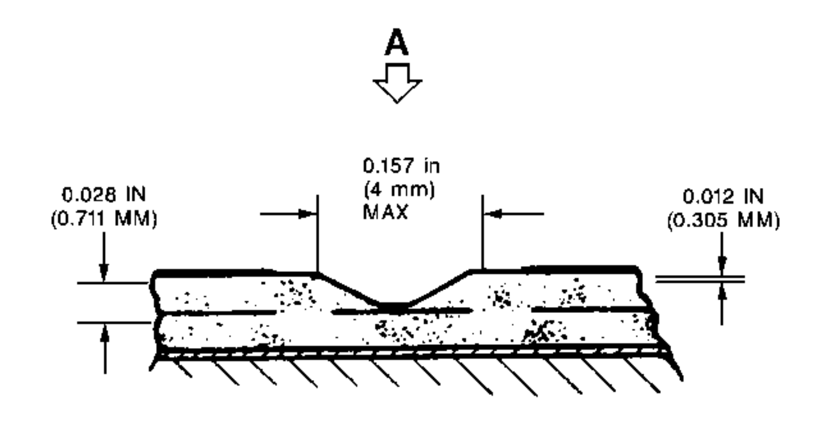
NOTE: The pot life of the mixture is 1 h at 21 deg C. Any mixture not used in this period must be discarded.

(2) Brush the mixture into the damaged area until it is slightly above the surface of the surrounding outer insulation.

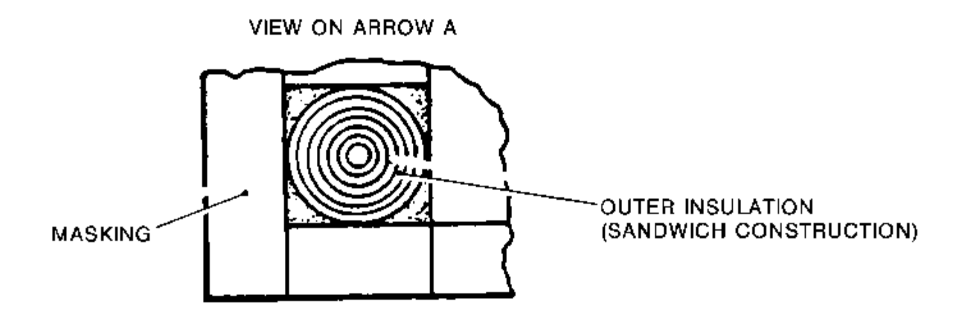
(3) Mount the infra-red lamp with the lens between 8 and 10 in (200 and 250 mm) from the repair.



TYPICAL SECTION THROUGH DE-ICING MAT



VIEW ON ARROW A



REPAIR TO OUTER INSULATION

CMB 30 12 00 8 AAM0 00

De-icing Mat outer Insulation Repair
Figure 801

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(4) Adjust the infra-red lamp to give a surface temperature of 100 deg C, then cure the repair for between 20 and 30 min.

(5) Carefully abrade the repair with the emery paper until it is level, but not below, the surface of the surrounding outer insulation.

(6) Remove swarf from the damaged area with a brush.

(7) Wash the damaged area with cleaning solvent.

(8) Check that the repair is effective by repeating the IR test (Ref. para.2.C.(7)).

RB D. Repair Outer Insulation - Using Filler Paste

RB NOTE: A mixture of filler paste type A NB0075-0165 and filler
RB paste type B NB0075-0166 may be used as an alternative to
RB a mixture of resin M527 and hardener M589.

RB (1) Mix filler paste type A NB0075-0165 with filler paste type B
RB NB0075-0166 as stated on the containers (ratio 1 to 1).

RB (2) Spread the mixture into the damaged area until it is
RB slightly above the surface of the surrounding outer
RB insulation. Allow the repair to self-cure at 21 deg C for
RB 20 hours or carry out steps (3) and (4) below.

RB (3) Mount the infra-red lamp with the lens between 8 and 10 in
RB (200 and 250 mm) from the repair.

RB (4) Adjust the infra-red lamp to give a surface temperature of
RB 95 deg C, then cure the repair for 30 min.

RB (5) Carefully abrade the repair with emery paper until it is
RB level, but not below the surface of the surrounding outer
RB insulation.

RB (6) Remove swarf from the damaged area with a brush.

RB (7) Wash the damaged area with cleaning solvent.

RB (8) Check that the repair is effective by repeating the IR test
RB (Ref. Para.2.C.(7)).

RB E. Conclusion

(1) Remove the IR tester from the aircraft.

(2) Repair the protective finish (Ref. para.4).

4. De-icing Mat Protective Finish Repair

A. Equipment and Materials

DESCRIPTION	PART NO.	LUCAS AEROSPACE PART NO.	REMARKS
Erocoat Black	M574	NB0075-145	16 Gram tin
Erocoat Hardener	M575	NB0075-146	4 Gram phial
Erocoat SEMKIT	-	N40060-2528	In lieu of M574/ M575 for large repair areas
Paint brushes, e.g., 0.5 in (15 mm) wide)	-	-	-
Emery paper, 240 grit	-	-	-
Kimwipe wipers or lint-free cloth	-	-	-
All the above items are available in a repair kit, Part No. NB0075/957			
250 W infra-red lamp	-	-	-
Thermometer with remote detector	-	-	-
General-purpose cleaning solvent BAC M302	ICI850/ 1012	-	-
Alternatives to the above solvent are:			
(a) Carbon tetrachloride	-	-	-
(b) Trichloro-ethane ('Genklene')	-	-	-

B. Repair Protective Finish

(1) Comply with the electrical safety precautions (Ref. para.2.B.).

(2) Prepare the repair mixture as follows:

(a) Empty the 5 g of Erocoat Hardener M575 into a container of Erocoat Black M574.

NOTE: The materials are normally supplied in the correct mixing proportions, i.e., the Hardener container holds 5 g (2 phials, each containing 2.5 g) and the Black container holds 20 g.

(b) Carefully mix the materials, ensuring that air is not introduced into the mixture.

NOTE: The pot life of the mixture is 1 h at 21 deg C. Any mixture not used in this period must be discarded.

(3) If aircraft-on-the-ground time is limited, apply the protective finish as follows:

(a) Wash the damaged area with solvent, then brush on three coats of the mixture, allowing 30 min drying time for each coat. Remove the masking tape and carry out the 'Conclusion' procedures (Ref. para.D.).

(b) After the next flight, carry out the preparation procedures detailed in paragraph 2., then wash the damaged area with solvent and brush on three further coats of the mixture, to the level of the existing protective finish, again allowing 30 min drying time for each coat.

(4) If more time is available, apply the protective finish as follows:

(a) Wash the damaged area with solvent, then brush on six coats of the mixture, to the level of the existing protective finish, allowing 30 min drying time for each coat. Remove the masking tape.

(b) Allow the repair to air-dry for at least 6 h.

(c) Mount the infra-red lamp with the lens between 8 and 10 in (200 and 250 mm) from the repair.

(d) Adjust the infra-red lamp to give a surface temperature of 95 deg C, then cure the repair for 1 h.

NOTE: If it is not possible to use an infra-red lamp, allow the repair to air-dry for at least 72 h. Times for air-drying are quoted for an ambient temperature of 21 deg C.

D. Conclusion

(1) Remove all equipment and materials.

(2) Remove the warning placard from the anti-icing control panel.

(3) Carry out an Operational Test of the appropriate left or right cyclic de-icing system (Ref. 30-11-00, Adjustment/Test).

AIR INTAKES - DESCRIPTION AND OPERATION

1. General

Electrical de-icing elements are installed on all the engine intake leading edges, and on certain leading edges inside the engine intakes. The majority of the elements are mineral-insulated (MI) cables buried in the metal surfaces. The remainder are de-icing mats bonded into recesses in the metal surfaces.

MI cables are provided on the engine intake centre wall, sidewall, top and bottom leading edges, and the rear ramp and air conditioning intake leading edges.

De-icing mats are provided on the spill door 'D' box leading edges.

A more detailed description of the installation is given in 30-21-00, and details of the power supplies applied to the elements are given in 30-11-00.

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INTAKE DE-ICING SUPPLY AND INSTALLATION - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)

Certain leading edges in and around the engine intakes are provided with electrical de-icing elements. The elements in each intake pair operate in conjunction with elements in the wing leading edges forward of the intakes (Ref. 30-12-00), to protect the engines from the ingestion of large particles of ice shed during flight. The de-icing installation controls the shedding in such a way that ice particles entering the engines are limited to an acceptable size.

The extreme leading edges of the engine intakes are designated, respectively, 'top lip', 'sidewall' and 'bottom lip', for each engine, and 'centre wall', for each pair of engines. De-icing elements are provided on all of these leading edges, and are integral with removable sections termed 'arrowheads'. Inside each engine intake, de-icing elements are provided on the leading edge of the rear ramp and the air conditioning intake, and a fairly large part of the spill door 'D' box. The elements on the rear ramp and air conditioning intake are integral with removable leading edge sections, but the elements on the 'D' box are preformed on part of the door structure, and are not individually removable.

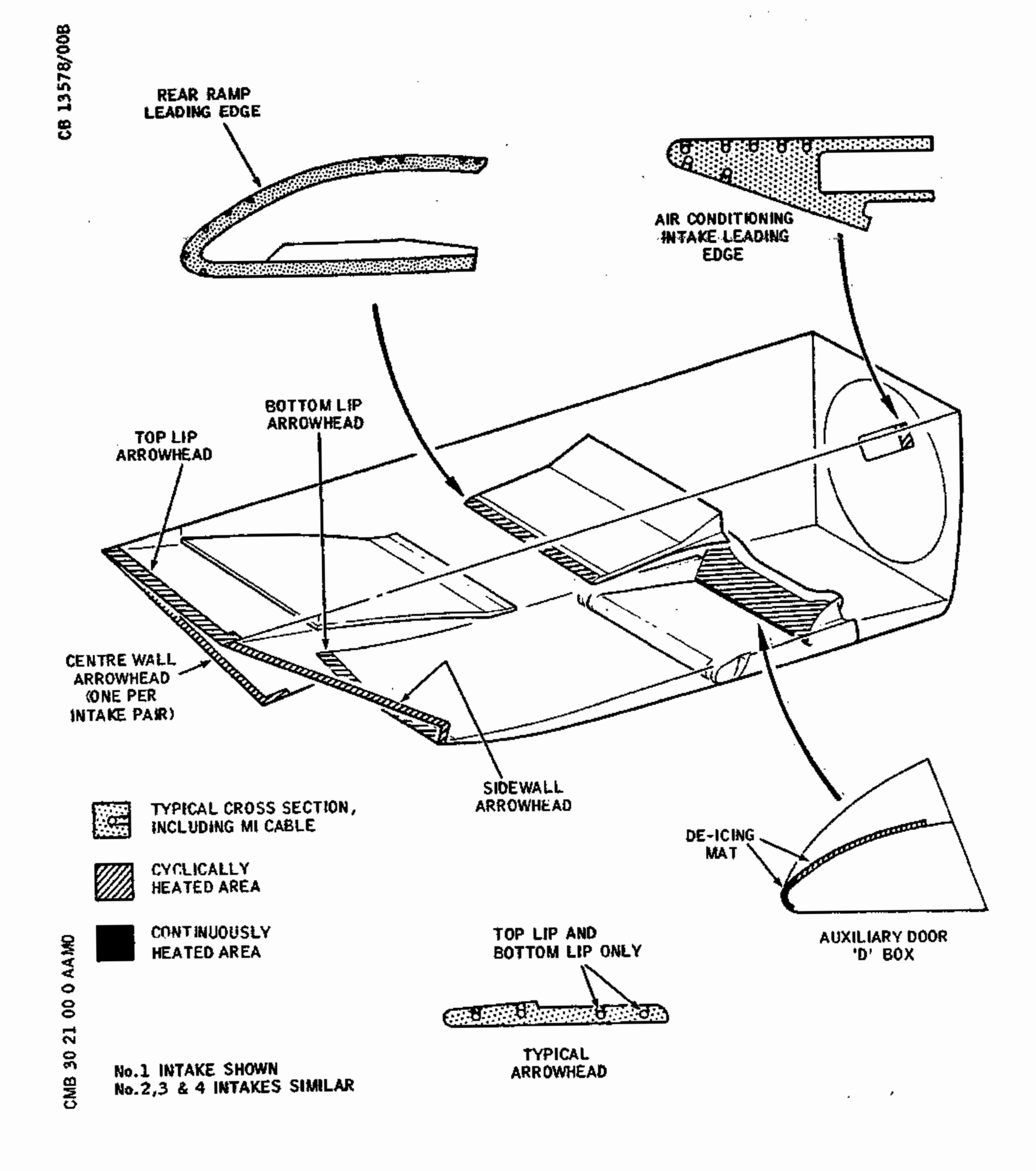
The majority of the de-icing elements are mineral-insulated (MI) cables, which are buried along the length of the appropriate leading edge to form one or more loops. The remainder of the elements are incorporated in de-icing mats, which are bonded direct to the metal surface.

The de-icing elements in each spill door 'D' box are incorporated in a single de-icing mat. Each mat is black and extends over the leading edge and upper surface of the 'D' box.

Mats without de-icing elements are provided in each engine intake. These mats are indistinguishable from de-icing mats and are located on the upper surface of the inlet vanes and the inside surfaces around the mouth of the engine intakes.

Most of the de-icing elements in each intake pair are interconnected to form nine separately switched cyclic de-icing loads. The remainder comprise four separately switched continuous de-icing loads.

Switching of the the power supplies for the cyclic de-icing loads is carried out by intake contactors. With the system operating, or under test, each intake contactor is energized,



R
Intake De-icing Elements
Figure 001

in turn, for a set period one or more times in a cyclic sequence.

In the roof of each intake is a switch unit which contains eight intake contactors, all designated alphabetically and some of them spare. The nine cyclic de-icing loads for each intake pair are applied by four of the contactors in the outboard intake switch unit and five in the inboard intake switch unit. The extra load applied via the inboard intake switch unit is a load common to both intakes, as it is made up from the elements in the centre wall and both sidewalls.

INTAKE/LOAD	CONTACTOR	LOCATION OF HEATERS
Outboard intakes		
Load 1	G	Forward MI cable loop on top and bottom lips, and ballast resistor on rear ramp.
Load 2	E	Aft MI cable loop on top and bottom lips.
Load 3	F	Not used.
Load 4	L	Rear ramp and air conditioning intake.
Load 5	J	Aft section of de-icing mat on spill door 'D' box.
Inboard intakes		
Load 1	G	Forward MI cable loop on top and bottom lips, and ballast resistor on rear ramp.
Load 2	E	Aft MI cable loop on top and bottom lips.
Load 3	F	Centre wall and two sidewalls.
Load 4	L	Rear ramp and air conditioning intake.

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INTAKE/LOAD	CONTACTOR	LOCATION OF HEATERS
Load 5	J	Aft section of de-icing mat on spill door 'D' box.

Intake Cyclic De-icing Loads
Table 1

Each load 1 is made into a three-phase load by utilizing an additional MI cable loop, which is designated a 'ballast resistor' and located on the rear ramp leading edge.

The de-icing elements of cyclic load 2 in each intake are connected across only two of the three phases of the power supplies. However, the associated protection circuits (Ref. 30-11-00) monitor load currents, and recognize only a three-phase, balanced current as a normal condition. For this reason, extra components are provided to prevent spurious failure indications that would occur each time one of these two-phase, unbalanced current loads is selected. The elements remain in a two-phase configuration, but the spurious failure indications are prevented at the current detection stage of the protection circuits. Each time a load 2 is selected, the detection stage is altered so that the two phases detected appear as three phases (Ref. 30-11-00).

The de-icing elements in the extreme forward part of the rear ramp and 'D' box leading edges, i.e., an MI cable loop and a portion of de-icing mat respectively, form four single-phase continuous de-icing loads for each intake pair. The 'D' box loads are required only if engine air demands open the associated inlet vanes more than 7.5 deg, therefore these loads are inhibited whenever the associated inlet vanes are below the 7.5 deg open position.

Power is available for all of the continuous de-icing loads whenever the system is operating or, for a limited period only, when the system is tested. Thus all of the loads are applied simultaneously, except perhaps for the 'D' box loads, which depend for their use on engine air demands. Switching of the power supplies for the loads is carried out by continuous heating control relays, which are energized by control or test selection supplies (Ref. 30-11-00).

2. De-icing Mats

The de-icing mats are located on the spill doors only, and are of sandwich construction. The multiple curvature of the 'D' box dictates the use of type 3A mats, which are built-up direct onto the 'D' box during manufacture.

The mat sandwich consists of an inner insulation layer, a metal-sprayed heating element applied in strips, an outer insulation layer and a hard, black protective finish. To ensure satisfactory dispersal of static electricity, the protective finish is of a conducting material. Terminal posts are soldered to the heating elements and connected to low-resistance wire terminations, which are provided to ensure moderate temperatures in the terminal areas.

3. Mineral-insulated (MI) Cables

MI cables are of very small diameter and consist of a conductor held concentrically in a metal sheath by a mineral insulant. Low-resistance wire terminations are provided to ensure moderate temperatures in the terminal areas.

Cyclic de-icing MI cables, which constitute the majority of the cables in the intakes (including the ballast resistors), have a centre conductor with a low temperature coefficient of resistance. These cables are held in grooves by brazing in the case of each top lip, sidewall, bottom lip and centre wall arrowhead, and by sprayed metal in the case of each rear ramp and air conditioning intake leading edge.

Continuous de-icing MI cables have a centre conductor with a relatively high temperature coefficient of resistance. This type of cable is bonded into grooves in the extreme forward part of each rear ramp leading edge only.

4. Operation (Ref. Fig.002 and 003)

A. Control and Indication

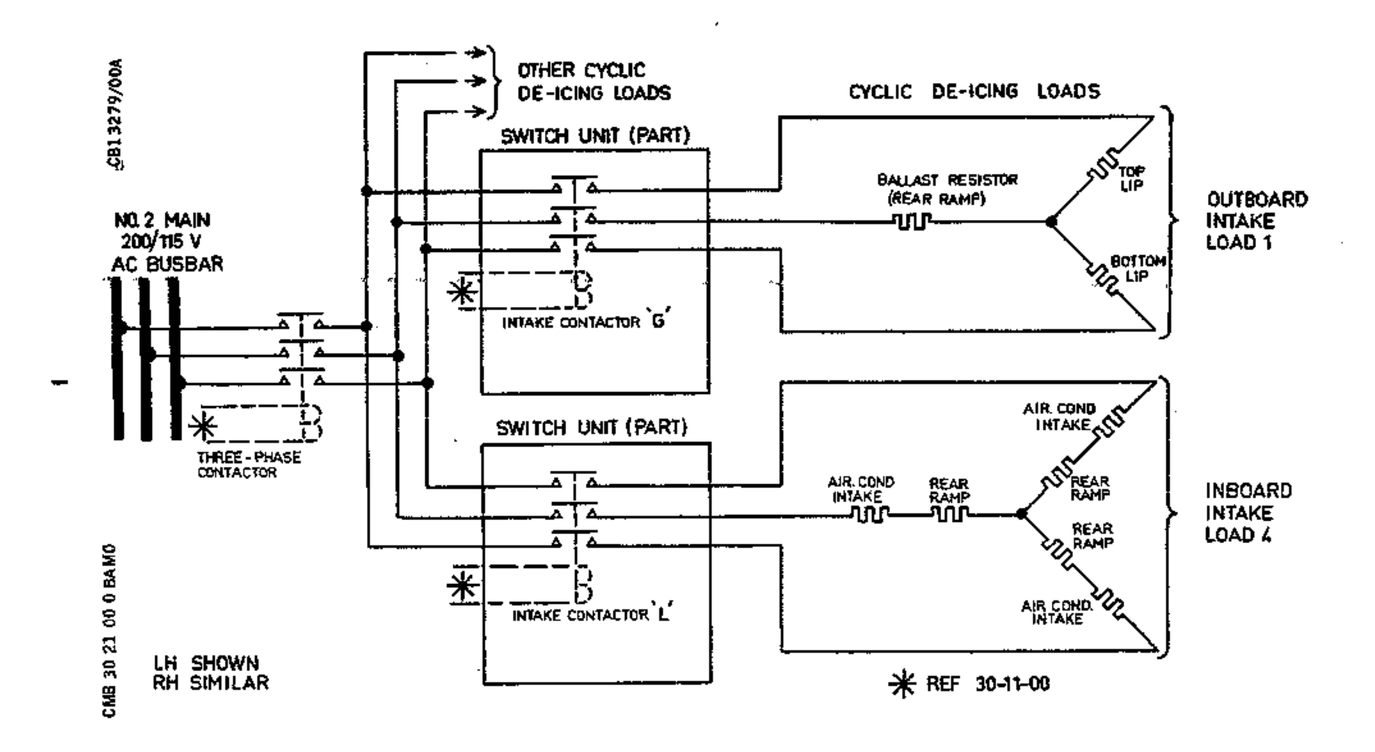
Control and Indication of the intake de-icing is described in 30-11-00.

B. Functional Description

(1) Cyclic De-icing

Cyclic de-icing is effected by applying power to each cyclic de-icing load in turn for a set period.

The power supplies for the cyclic de-icing loads on each side of the aircraft are taken direct from main a.c. busbars, and are routed through left and right



Typical Intake Cyclic De-icing Loads - Simplified Schematic
Figure 002

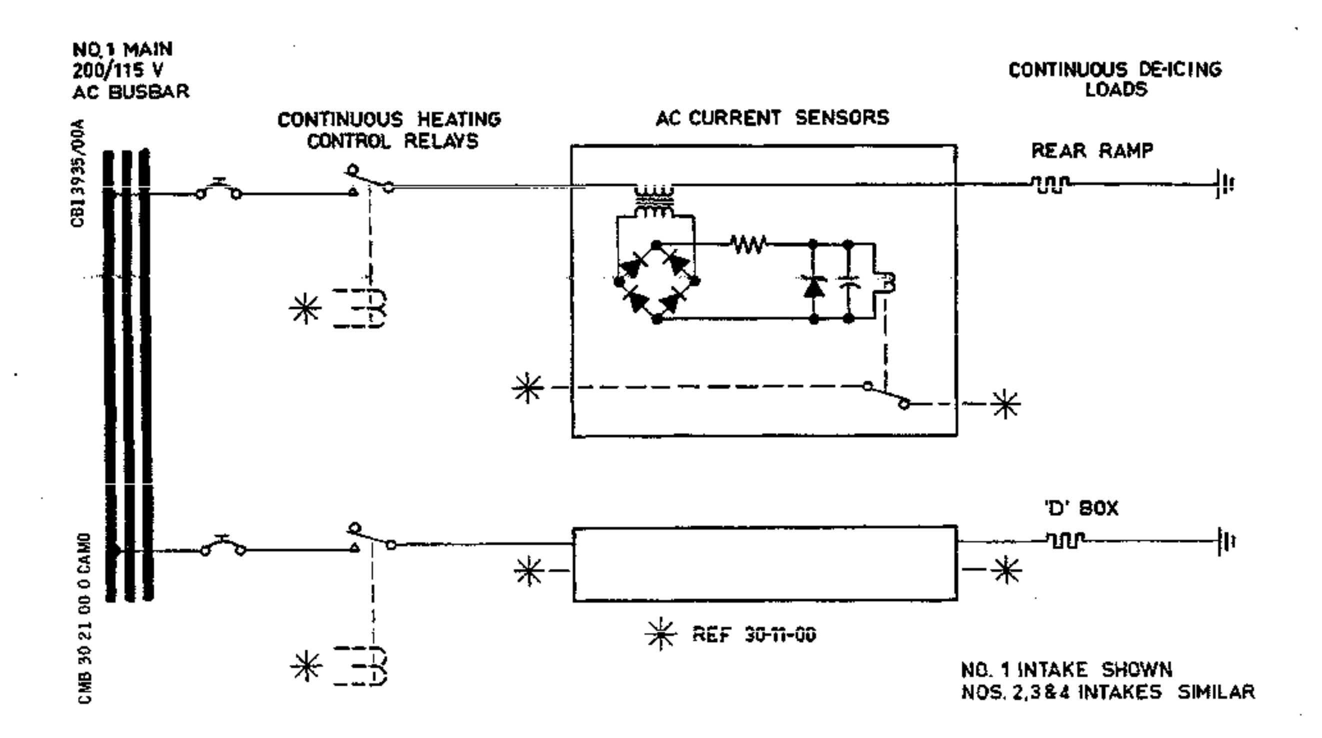
three-phase contactors. Circuit breakers are not provided. However, if certain high-risk current conditions occur, isolation is rapidly achieved by the automatic de-energization and locking out of the appropriate three-phase contactor.

Those intake contactors that control de-icing loads, i.e., the nine in each intake pair, together with one additional contactor for each outboard intake, are energized one at a time by programmed output pulses from a cyclic timer and protection unit. The additional contactor for each outboard intake, designated load 3, is energized, but is not used (Ref. 30-11-00).

(2) Continuous De-icing

Continuous de-icing is effected, as required, by applying power to the continuous de-icing loads.

The power supplies for the continuous de-icing loads



Intake Continuous De-icing Loads - Simplified Schematic
Figure 003

on each side of the aircraft are taken via circuit breakers from main a.c. busbars. The supplies for the loads in each intake pair are routed through four continuous heating control relays. The two relays that apply the rear ramp loads also apply loads in the associated wing leading edge.

Power for energizing the control relays is available whenever the system is operating and also, for a limited period only, when the system is being tested. However, the relays that apply the 'D' box loads are further controlled by microswitches and are therefore not energized unless the inlet vanes open more than 7.5 deg.

Interposed between each de-icing load and its associated control relay is an a.c. current sensor, which illuminates an associated failure warning caption if the current flow in the load falls below a certain level. Failure indications for the 'D' box loads are suppressed when the loads are inhibited

due to closure of the inlet vanes.

C. Electrical Power Supplies

Electrical power is supplied from the busbars listed in Table 2. It should be noted that each supply is applied to loads in each intake pair and the associated wing leading edge.

SERVICE	BUSBAR	CIRCUIT BREAKER PANEL
Left wing and intakes cyclic heaters	No.2 main 200/115 V a.c.	-
Left continuous heaters	No.1 main 115 V a.c.	14-215
Right wing and intakes cyclic heaters	No.3 main 200/115 V a.c.	-
Right continuous heaters	No.4 main 115 V a.c.	14-216

Electrical Power Supplies
Table 2

5. System Management

System management for the intake de-icing is described in 30-11-00.

INTAKE DE-ICING SUPPLY AND INSTALLATION - INSPECTION/CHECK

WARNING: OBSERVE THE ELECTRICAL AND HYDRAULIC SAFETY PRECAUTIONS DETAILED IN 24-00-00 AND 29-00-00 RESPECTIVELY.

WHEN WORKING ON OR AROUND THE ENGINE INTAKES, OBSERVE THE SAFETY PRECAUTIONS DETAILED IN 71-62-00, SERVICING.

CAUTION: IF AN "INT 1 & 2", "INT 3 & 4" OR "CYCLIC" CAPTION IS ILLUMINATED WITH THE SYSTEM SWITCHED OFF, ISOLATE THE ASSOCIATED HEATING POWER SUPPLIES IMMEDIATELY (REF. 30-11-00, ADJUSTMENT/TEST).

1. General

R A single de-icing mat and mineral-insulated (MI) cable loops
are installed in each engine intake for de-icing purposes.
R Also, there are several 'dummy' mats, without heating elements.
R Faults occurring in the MI cables would not be visually appar-
R ent, therefore this topic is limited to an inspection of the
R de-icing mats and the dummy mats only.

All mats are black and are bonded to, or preformed on, the associated surface, depending on the curvature. The mat on each spill door 'D' box is the de-icing mat; the mats on the upper surface of each inlet vane, and the inside surfaces at the mouth of the engine intakes are dummy mats.

2. Inspection

A. Prepare

(1) Ensure that the MAIN, ALTERN and TEST selector switches on the WING AND INTAKE ANTI-ICING portion of flight compartment roof panel 4-211 are set to an OFF position.

(2) Place a notice on the flight compartment centre console, warning that the de-icing system is being worked on.

R (3) Open the intake spill door in accordance with
R 71-64-00, Servicing, and manually open the inlet
R vane.

B. Inspect

NOTE: It is not necessary to enter the engine intakes to inspect the mats.

(1) Comply with the safety precautions.

R (2) Inspect the black protective finish of each de-icing mat for freedom from:

R (a) Charred patches, blisters and discolouration,

R (b) Scratches, cracks and chips.

R (c) Excessive erosion, which would be indicated by exposure of the red-brown outer insulation layer.

R (3) Inspect the black protective finish of each dummy mat for freedom from:

R (a) Scratches, cracks and chips.

R (b) Excessive erosion, which would be indicated by exposure of the red-brown outer insulation layer.

R (4) Inspect each spill door inlet vane dummy mat for perforation damage.

R (5) Carry out a "Tap Test" on each spill door inlet vane dummy mat to check for delamination of the dummy mat from the upper surface of the vane.

R NOTE: Any damage to the inlet vane dummy mats is to be repaired in accordance with the Structural Repair Manual 54-21-00. Repairs to other de-icing and dummy mats are to be carried out in accordance with 30-21-00, Approved Repairs.

C. Conclusion

(1) Remove the warning notice from the flight compartment centre console.

R (2) Close the intake spill door and inlet vane then cancel the safety precautions associated with the engine intakes (Ref. 71-62-00).

INTAKE DE-ICING SUPPLY AND INSTALLATION - APPROVED REPAIRS

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

WHEN WORKING ON OR AROUND THE ENGINE INTAKES, OBSERVE THE SAFETY PRECAUTIONS DETAILED IN 71-62-00, SERVICING.

FUMES FROM CLEANING SOLVENTS ARE TOXIC; ENSURE THAT THE WORKING AREA IS FREELY VENTILATED.

CAUTION: DO NOT USE THE DE-ICING MAT HEATING ELEMENTS AS A HEAT SOURCE TO CURE REPAIR MATERIALS.

1. General

Each engine intake contains only one de-icing mat, and this is located on the spill door 'D' box. However, each engine intake also contains several 'dummy' mats, some of which contain no heating elements, while others contain inoperative elements. These dummy mats are located on the inlet vanes and the inside surfaces around the mouth of the engine intakes.

R 2. Repair of Damaged De-icing Mat

(1) Assessment of damage and the repair of de-icing mats must be carried out using the procedures detailed in 30-12-00, Approved Repairs, with the following differences:-

(a) The EARTH lead of the IR tester should be connected as follows:-

a1) For the cyclically de-iced portion of each mat,
R first gain access to the appropriate switch
R unit (Ref. 30-11-12, Removal/Installation) and then refer to the applicable wiring diagram. Disconnect the appropriate connector from the switch unit and, using suitable adapters, connect the EARTH lead to all three pins leading to the de-icing mat.

a2) For the continuously de-iced portion of each mat, refer to the applicable wiring diagram and, using a suitable adapter, connect the EARTH lead to the appropriate pin of test socket UT1805, on the LH ice relay box (panel 13-123), for the left intakes and UT1806, on the RH ice relay box (panel 16-123), for the right intakes.

(2) An Operational Test of the left or right continuous de-icing sub-system must be carried out after repair to the continuously de-iced portion of the de-icing mat (Ref. 30-11-00, Adjustment/Test).

NOTE: It is not necessary to enter the engine intake to carry out a repair; the mat is accessible when the associated spill door has been opened and the inlet vane unlocked and opened as required (Ref. 71-62-00).

3. Repair of Externally Damaged Dummy Mat

(1) Assessment of damage and the repair of dummy mats must be carried out using all the procedures detailed in 30-12-00, Approved Repairs, except for the IR tests and Operational Tests, which are not necessary and may be omitted.

NOTE: It is not necessary to enter the engine intake to carry out a repair on the inlet vane dummy mat; the mat is accessible when the associated spill door has been opened and the inlet vane unlocked and opened as required (Ref. 71-62-00).

4. Repair of Delaminated Dummy Mat

WARNING: IF IT IS FOUND NECESSARY TO ENTER AN INTAKE, OBSERVE THE WARNINGS, CAUTIONS AND NOTES DETAILED IN 71-63-00, SERVICING.

NOTE: The following procedures apply only to the aft centre-wall corner of each bottom lip dummy mat.

A. Equipment and Materials

DESCRIPTION	PART NO.
Araldite adhesive	AV138
Araldite hardener	HV998
Cleaning solvent (trichlorotrifluoromethane)	Freon R113 or equivalent
Quantity of shot-bags (lead weighting material) sufficient to load the delaminated area to not less than 10 lbf/sq in (0.7 kgf/sq cm)	-

R

DESCRIPTION	PART NO.
Kimwipe tissues	-

R B. Prepare to Repair Delamination

(1) Gently lift the delaminated material and, using a suitable spray or brush, thoroughly clean the surfaces to be repaired with the cleaning solvent.

NOTE: The cleaning solvent is self-drying. However, as it dries it cools the cleaned surface, which under normal conditions will take at least 30 min to return to ambient temperature. An infra-red lamp or hot air supply may be used to reduce the time required.

WARNING: CONTACT WITH EPOXY RESINS (E.G., ARALDITE) MUST BE AVOIDED. IF CONTACT IS MADE ACCIDENTALLY, WASH THE AFFECTED AREA IMMEDIATELY WITH SOAP AND WARM WATER. IF CUTS OR ABRASIONS ARE INVOLVED, SEEK MEDICAL ADVICE.

(2) Prepare the adhesive by thoroughly mixing 100 parts by weight of adhesive AV138 with 40 parts by weight of hardener HV998.

NOTE: The pot life of 100 g of adhesive is 30 min at +25 deg C (77 deg F). Any mixture not used in this period must be discarded.

C. Repair Delamination

(1) Gently lift the delaminated material and apply a layer of prepared adhesive under the full extent of the delamination.

(2) Press down and smooth-out the repaired portion of dummy mat, then load it with shot-bags to a pressure of 10 lbf/sq in (0.7 kgf/sq in cm), if space permits.

(3) Allow the repair to cure for the appropriate period listed below.

	AMBIENT TEMP.	CURE TIME
R	+15 deg C (59 deg F)	14 h
R	+20 deg C (68 deg F)	8 h
R	+40 deg C (104 deg F)	2 h
R	+80 deg C (176 deg F)	15 min

R (4) Remove the shot-bags.

R R R (5) Taking care not to damage the black protective finish of the dummy mat, cut back and smooth down any excess adhesive.

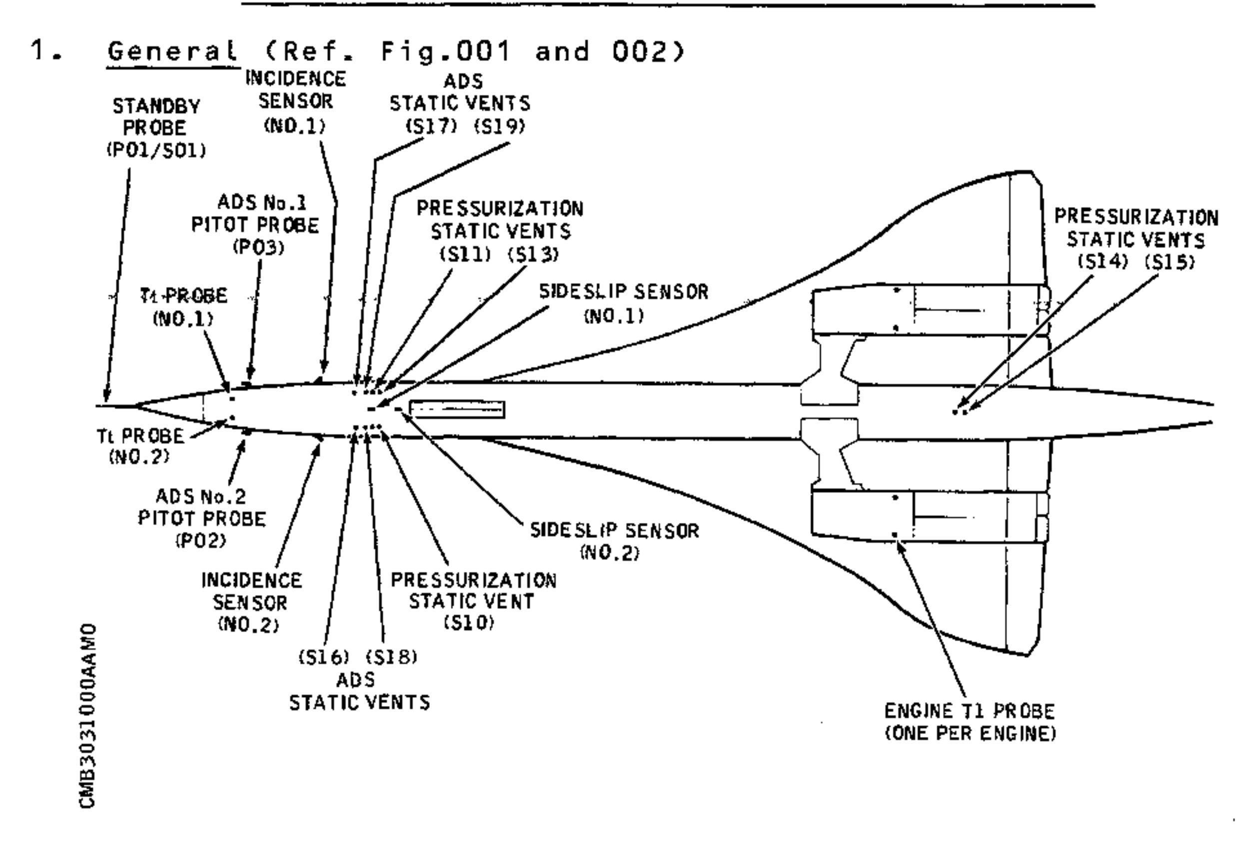
R (6) Remove adhesive particles with a Kimwipe tissue.

R D. Conclusion

R R (1) Ensure that the intake is free from all extraneous items.

PITOT AND STATIC - DESCRIPTION AND OPERATION

1. General (Ref. Fig.001 and 002)



Probe, Vent and Sensor Heating
Figure 001

All of the air data sensing probes, vents and sensors exposed to icing conditions are provided with electrical heating elements. The heat applied prevents the accretion of ice which could cause errors in the pressure and temperature measurements.

The heating loads can be classified into four distinct groups as follows:-

(1) ADS (air data system) probes, vents and sensors (Ref. 34-11-00 and 34-12-00).

(2) Engine inlet temperature (T1) probes (Ref. 76-11-00).

(3) Standby pitot/static probe (Ref. 34-11-00).

(4) Pressurization static vents (Ref. 21-31-00 and

21-32-00).

NOTE: References in brackets indicate which system or
R systems the probes, vents or sensors are associated with.

Failure indications are provided for all groups except the pressurization vents. When failures occur, a.c. current sensors in the associated circuits illuminate failure warning captions on a warning lights module.

The ADS heaters are controlled by left-hand and right-hand probe heaters switches, engraved ADS 1 and ADS 2 respectively. The heating loads associated with each switch comprise a pitot probe, two static vents, an incidence sensor, a sideslip sensor and a total temperature probe. The loads controlled by the left-hand and right-hand switches are located on the left and right sides of the aircraft respectively, except for the static vents which are located one on each side. Each switch has an ON position and a Tt INHIB position. With the switches in the ON position, all the heaters are operable. However, with the switches in the Tt INHIB position, all the heaters with the exception of the Tt probes are operable.
R This facility is provided for use below 100 kt, and obviates
R false and potentially damaging outputs from the Tt probes due to self-heating.

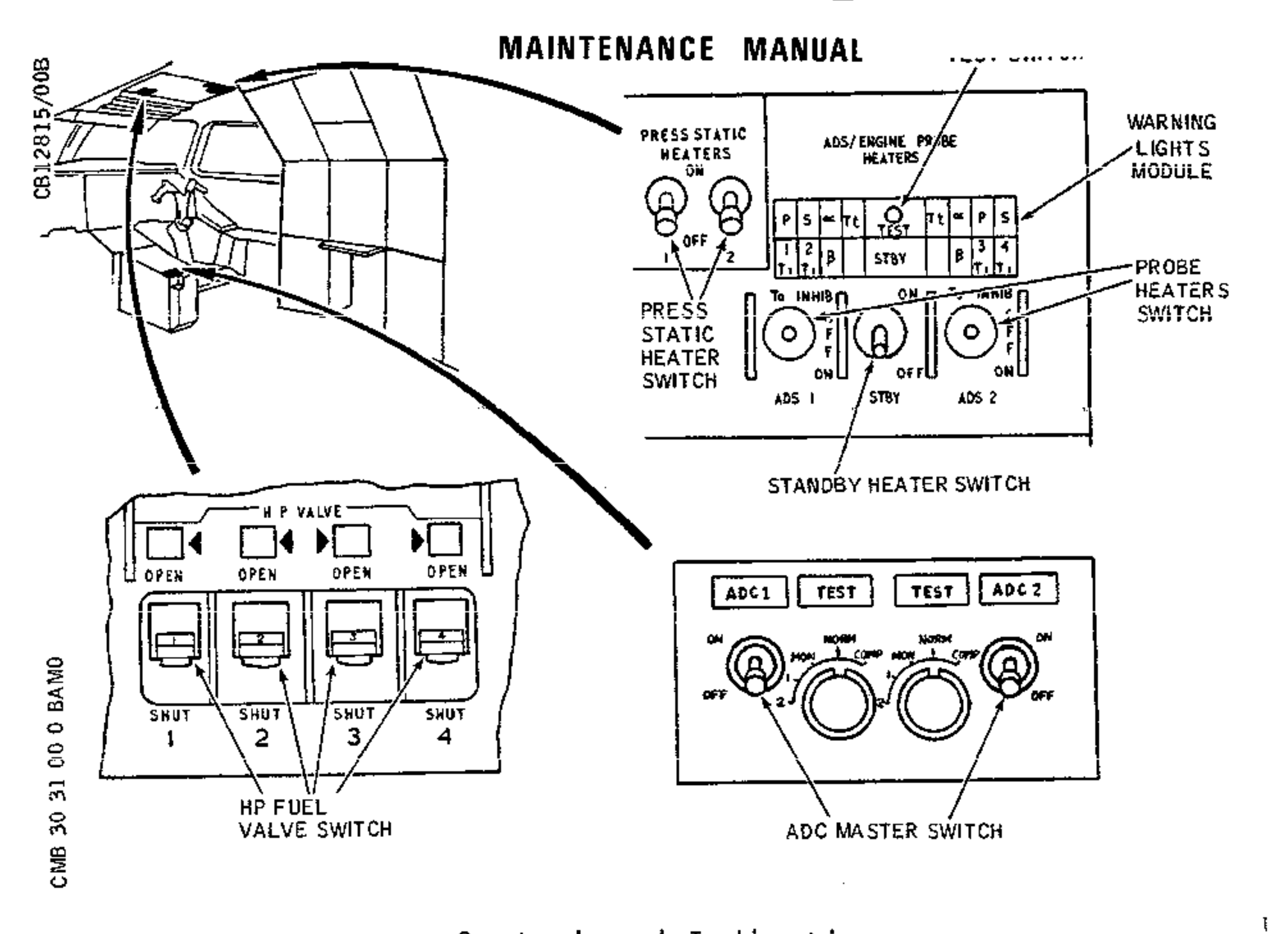
The engine T1 probe heaters are controlled by engine HP fuel valve selection.

Heating for the standby probe is controlled by a standby heater switch engraved STBY.

The pressurization static vent heaters are controlled by two PRESS. (pressurization) STATIC HEATERS switches engraved 1 and 2. The heating loads associated with the No.1 pressurization system, namely, the forward and rear regulating valves and the pressure controller amplifier, are controlled by the No.1 switch, and the heating loads associated with the No.2 pressurization system, namely, the forward and rear regulating valves, are controlled by the No.2 switch.

2. AC Current Sensor (Ref. Fig. 003, 004 and 005)

Fifteen a.c. current sensors are interposed in the power supplies to the heating elements to sense the input to each load. The sensors are mounted on shelves/panels in the underfloor baggage compartment and the flight compartment racking, as detailed in Table 1.



R Control and Indication
Figure 002

GROUP	SENSOR QUANTITY	SHELF IDENT.
ADS No.1	5	21-123
ADS No.2	5	23-123
No.1 T1 probes	2	1-131
No.2 T1 probes	2	1-132
Standby probe	1	23-123

Location of Current Sensors
Table 1

In each sensor, power for the associated load is applied

via a transformer, which energizes an integral relay, provided the load current is in excess of a pre-set level.
R Contacts of this relay control a failure warning caption on a warning lights module.

3. Warning Lights Module (Ref. Fig.002 and 006)

The warning lights module incorporates fifteen failure warning captions and a TEST push-switch, and is located on panel 4-211 in the flight compartment roof. The test switch and a STBY failure warning caption form a dividing line between two groups of failure warning captions, seven each for the left and right sides of the aircraft. When illuminated, the captions display symbols related to associated loads. The captions and associated loads are identified in Table 2.

	CAPTION	HEATING LOAD
	P	Pitot probe
R	S	Two static vents
	Alpha (symbol)	Incidence sensor
	Beta (symbol)	Sideslip sensor
	Tt	Total temperature probe
	1T1	No.1 engine T1 probe
	2T1	No.2 engine T1 probe
	3T1	No.3 engine T1 probe
	4T1	No.4 engine T1 probe
	STBY	Standby pitot/static probe

Failure Warning Captions
Table 2

4. Power Relays (Ref. Fig. 003)

Six power relays, three each for the ADS No.1 and ADS No.2 systems, are mounted three on panel 13-123 (LH ice relay

box) and three on panel 16-123 (RH ice relay box) respectively.

The relays effect control over the power supplies to the associated heating loads. Two of the relays, controlling the power supplies to the pitot probes, are energized all the time the systems are switched on. The remaining four are energized only when the systems are switched on and associated ADC slave relays are energized.

5. ADC Slave Relays (Ref. Fig. 003)

Two ADC slave relays, one each for the ADS No.1 and ADS No.2 systems, are mounted one on panel 13-123 and one on panel 16-123 respectively.

The relays effect control over associated power relays, and are controlled by earth switches integral with associated air data computers (Ref. 34-11-00). These earth switches are open with the total temperature above +15 deg C, but closed to energize the slave relays whenever the total temperature is below +15 deg C.

R Contacts of these relays carry out primary functions
R in the wing and intake de-icing (Ref. 30-11-00) and
R drain mast heating systems (Ref. 30-71-00).

6. Control Relays (Ref. Fig. 007)

Two control relays, one for each group of pressurization static vents, are mounted one on panel 13-123 and one on panel 16-123.

The relays, which are designated No.1 and No.2, control the power supplies to the heating loads and are energized whenever the heaters are switched on.

7. Operation

A. Control and Indication (Ref. Fig. 002)

The majority of the controls and indicators are located on panel 4-211 in the flight compartment roof. Associated switches are located on panel 9-211 on the centre console.

All filaments can be dimmed or checked for operation by an associated switch (Ref. 33-14-00).

Two probe heaters switches, with three positions (Tt INHIB - OFF - ON), provide primary control over the ADS heaters. In the ON position, all of the

associated loads are made operable whereas in the Tt INHIB position all the loads with the exception of the total temperature probe heaters are made operable.

R Four HP VALVE switches control associated HP fuel valve slave relays which, in turn, provide direct control over the T1 probe heaters.

A STBY switch, with two positions (ON - OFF) provides direct control over the standby probe heater.

Two PRESS. STATIC HEATERS switches, 1 and 2, with two positions (ON - OFF), provide primary control over the two groups of pressurization static vent heaters. With the left-hand switch (1) in the ON position the heaters associated with two regulating valves and a pressure controller amplifier are made operable. Setting the right-hand switch (2) to the ON position makes the heaters associated with two regulating valves operable.

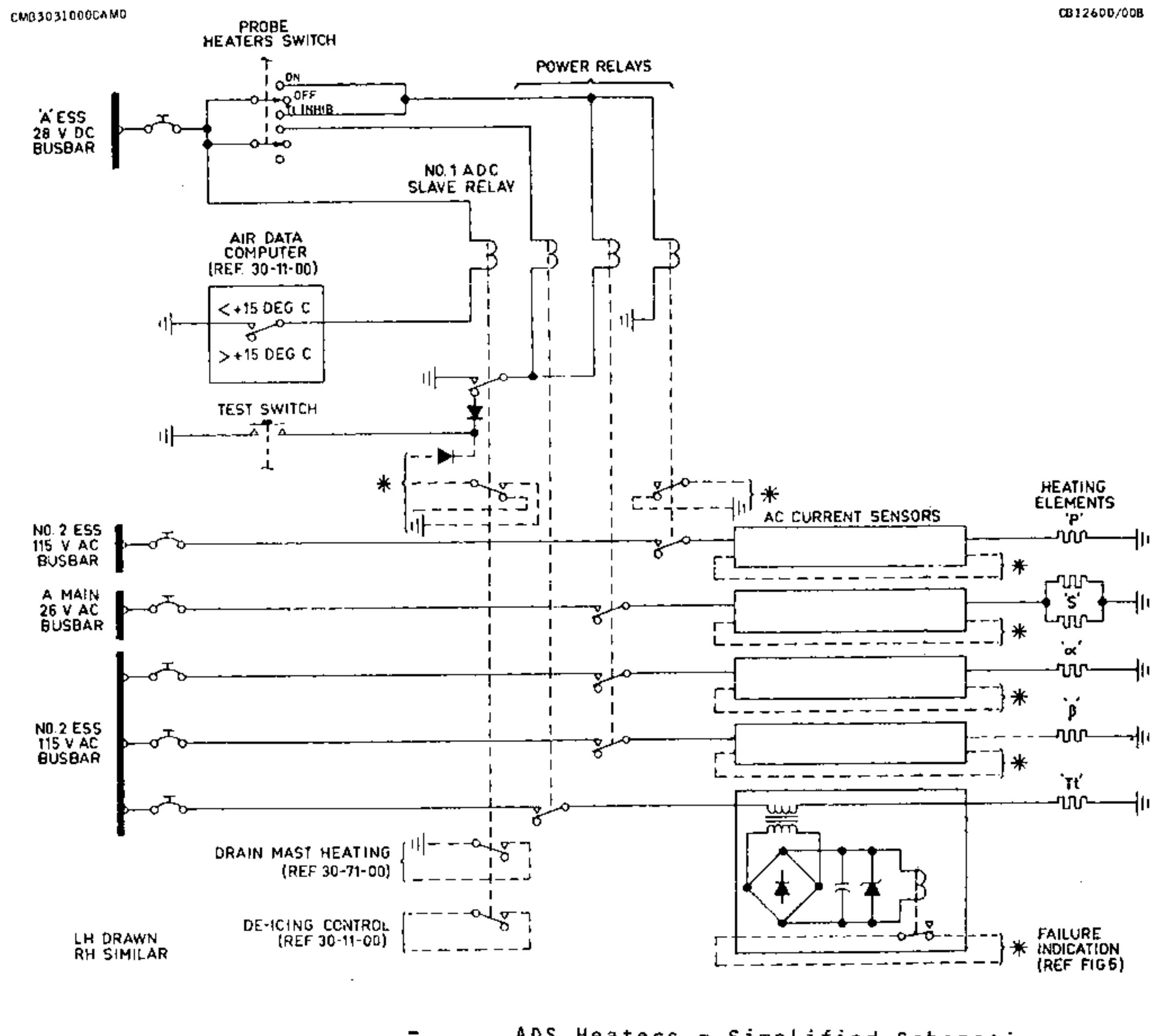
All the failure warning captions on the warning lights module are operated by earth-connected switches. The indicators associated with the ADS heaters are further controlled by ADC master switches located on panel 9-211 (Ref. 34-11-00). With these switches in the OFF
R position an inhibit is placed on the applicable captions.

Illumination of any one of the failure warning captions means that an a.c. current sensor has detected a load failure. The captions associated with the engine T1 probes and the standby probe will be illuminated whenever the heaters are in the 'off' condition due to engine shut-down or failure.

B. Functional Description

(1) ADS Heaters (Ref. Fig. 003)

The ADC slave relays continuously control two of the three power relays in each system in such a manner that an earth return is available for the relays whenever the total temperature falls below +15 deg C. With the total temperature below +15 deg C, setting a probe heaters switch to the ON position energizes all three power relays and applies all the associated loads. Setting the switch to the Tt INHIB position under these conditions energizes only two of the power relays, applying all the loads with the exception of the total temperature probe.



R

ADS Heaters - Simplified Schematic
Figure 003

EFFECTIVITY: ALL

BA

With total temperatures in excess of +15 deg C, an inhibit is placed on the operation of two of the three power relays in each system. Thus only the relay associated with the pitot probe heater is energized when a probe heaters switch is set to an 'on' position.

Testing of the ADS heaters is carried out by applying the loads and observing the failure warning captions for correct operation. Applying the loads is carried out by energizing the power relays. Thus in total temperatures below +15 deg C, merely setting a probe heaters switch to an 'on' position achieves the desired result, the earth returns for the power relays and failure warning captions being provided by the energized ADC slave relay. At total temperatures above +15 deg C the probe heaters switches are, as before, set to an 'on' position but in addition the test switch is held depressed, thereby providing an alternative earth return for the power relays and captions.

(2) Engine T1 Probe Heaters (Ref. Fig. 004)

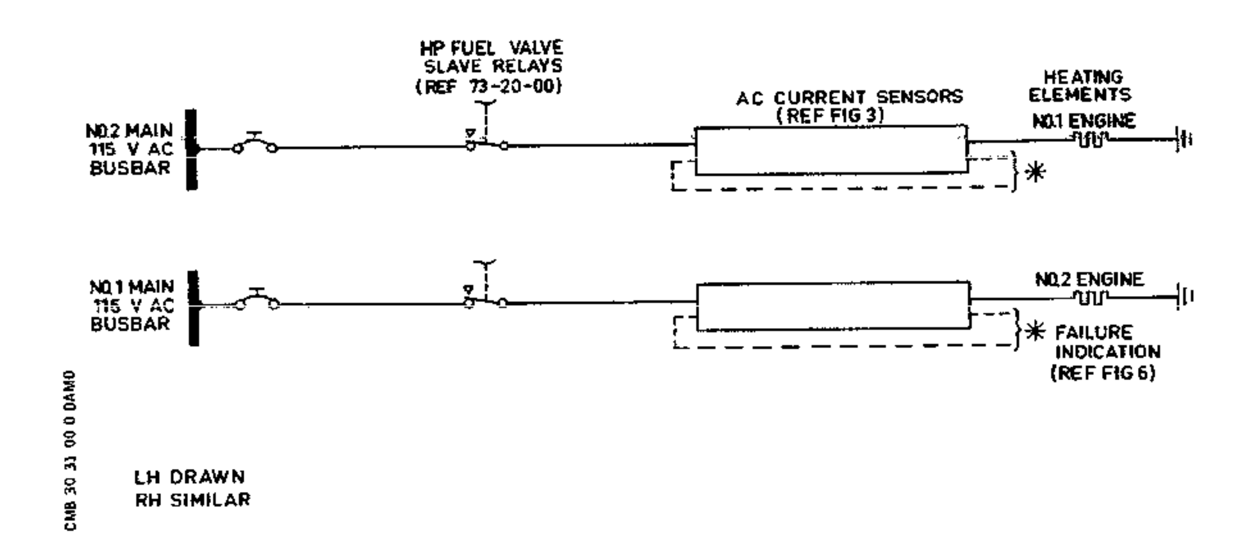
The T1 probe heater is inhibited with the HP VALVE switch in the SHUT position, due to energization of an associated HP fuel valve slave relay (Ref. 73-20-00). Setting the switch to OPEN de-energizes the relay, and power is applied to the heater. Although the relay, and hence the heater, is normally controlled by the HP VALVE switch, it is additionally controlled by an engine shut down handle (Ref. 26-22-00) which, when pulled, overrides the HP VALVE switch and energizes the slave relay.

(3) Standby Probe Heating (Ref. Fig. 005)

With the standby heater switch set to the ON position, the load is applied.

(4) Failure Indication (Ref. Fig. 006)

The power supplies for the failure warning captions associated with the T1 probes and the standby probe are applied direct from the busbar. To minimize the number of captions illuminated on the ground, the supplies for the captions associated with the ADS heaters are routed through contacts of associated ADC master switches, which are normally switched off on the ground.

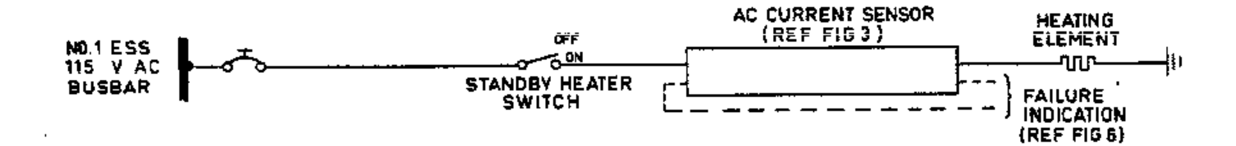


- Engine T1 Probe Heaters - Simplified Schematic
Figure 004

Provided the total temperature is below +15 deg C, the ADC slave relay contacts provide the earth return essential for the operation of the failure warning captions associated with the ADS heaters.

In flight, with all the heaters correctly applied, the relays integral with the a.c. current sensors are held in the energized condition, inhibiting the failure warning indications. In the event of an abnormal current condition, caused either by an open-circuited load or a tripped circuit breaker, the associated integral relay will de-energize to illuminate the appropriate failure warning caption.

The pitot probe heaters are normally switched on for all phases of flight, therefore the probe heaters switches are normally set to an 'on' position regardless of the total temperature. To provide a reminder, the P captions are illuminated if the probe heaters switches are off. The remainder of the ADS captions will also be illuminated, provided the ADC master switches are in the 'on'



- Standby Probe Heating - Simplified Schematic
Figure 005

position. In total temperatures below +15 deg C, contacts of the ADC slave relays provide the earth returns essential for operation of the captions, and in total temperatures above +15 deg C contacts of the power relays associated with the pitot probe heaters provide the earth returns.

Operation of the test push-switch, in total temperatures above +15 deg C, provides an earth return for the associated failure warning captions coincident with energization of the power relays.

(5) Pressurization Static Vent Heaters (Ref. Fig. 007)

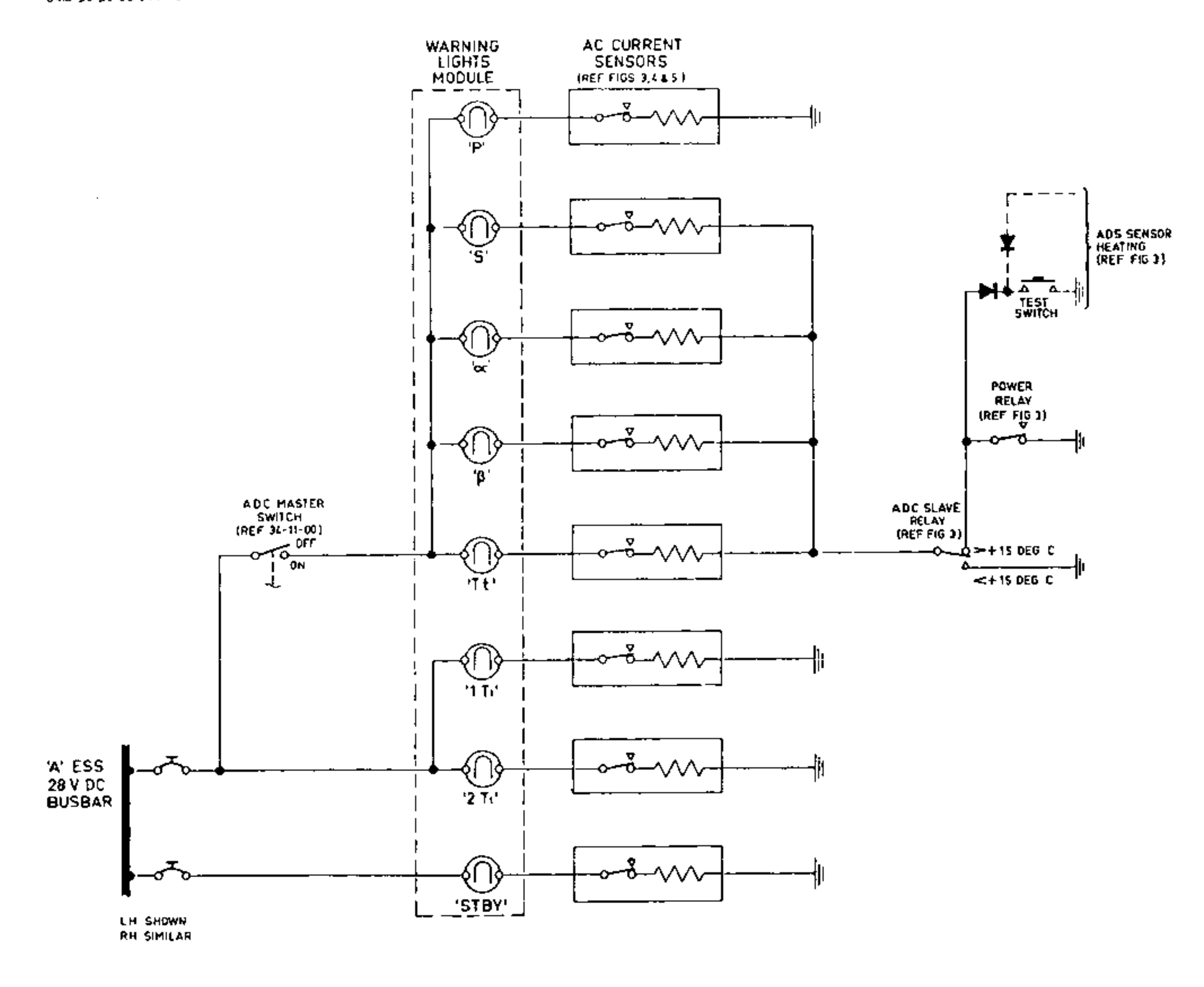
Setting a press. static heater switch to the ON position energizes the associated control relay which, in turn, applies power to the appropriate group of pressurization static vent heaters.

C. Electrical Power Supplies

The electrical power supplies are detailed in Table 1.

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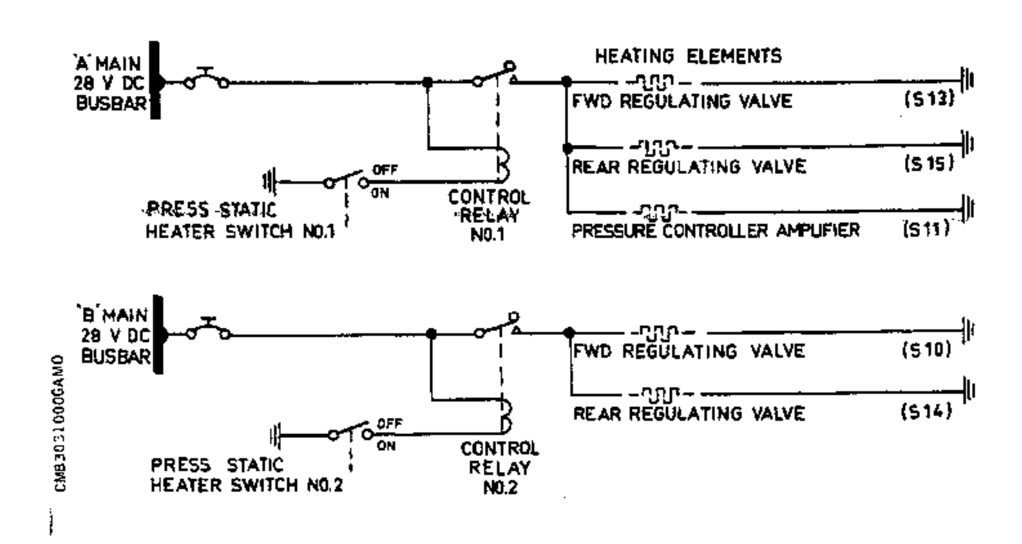
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R - Failure Indication - Simplified Schematic
Figure 006

EFFECTIVITY: ALL

BA



Pressurization Static Vent Heaters -
Simplified Schematic
Figure 007

SERVICE	BUSBAR	CIRCUIT BREAKER PANEL
ADS heaters		
No.1 heater control	'A' essential 28 V d.c.	1-213
No.1 heater indication	'A' essential 28 V d.c.	1-213
No.1 sideslip heater supply	No.2 essential 115 V a.c.	2-213
No.1 incidence heater supply	No.2 essential 115 V a.c.	2-213
No.1 pitot heater	No.2 essential	2-213

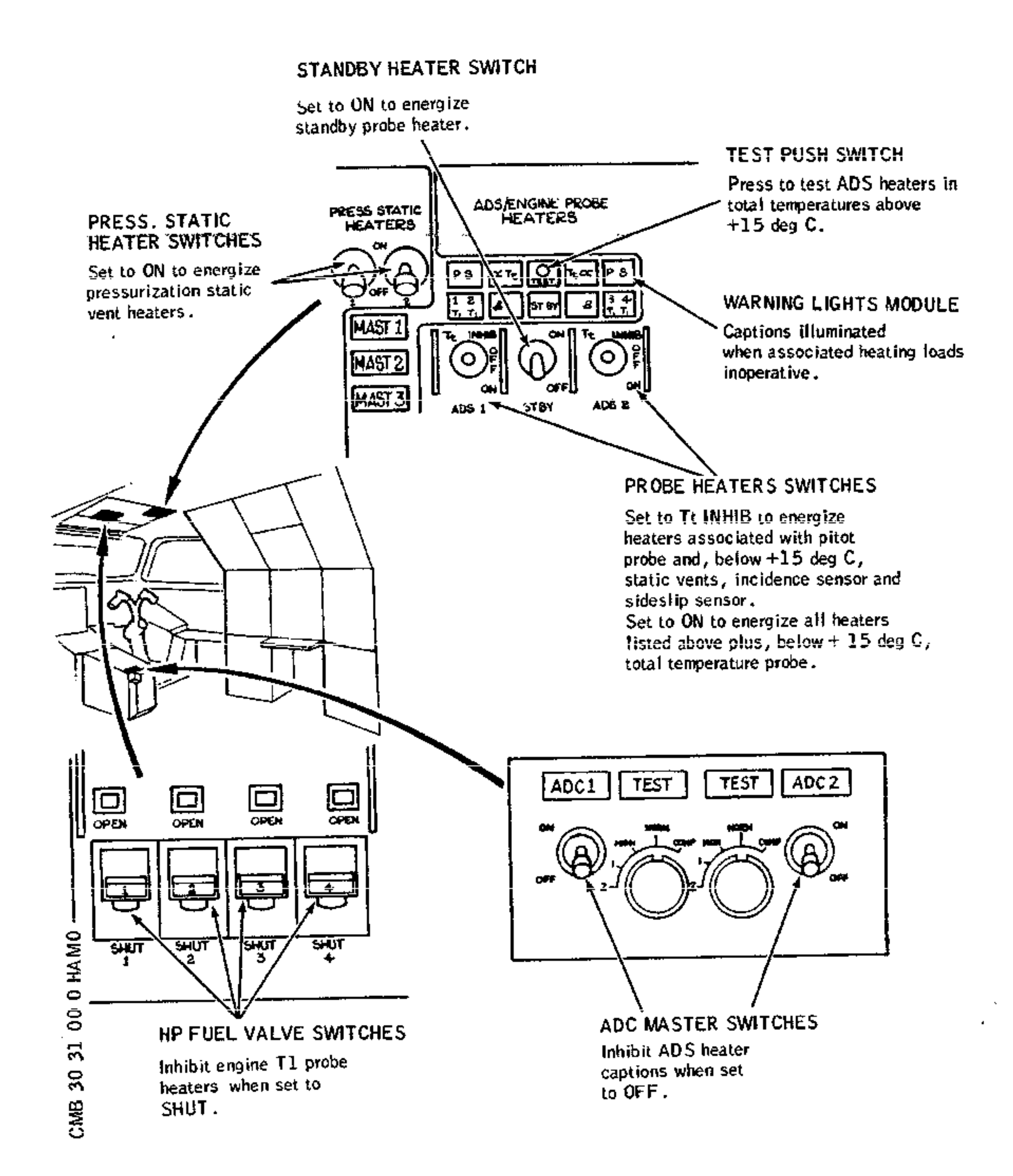
SERVICE	BUSBAR	CIRCUIT BREAKER PANEL
supply	115 V a.c.	
No.1 static heater supply	'A' main 26 V a.c.	13-215
No.1 total temp. heater supply	No.2 essential 115 V a.c.	2-213
No.2 heater control	'B' essential 28 V d.c.	3-213
No.2 heater indication	'B' essential 28 V d.c.	3-213
No.2 sideslip heater supply	No.3 main 115 V a.c.	13-216
No.2 incidence heater supply	No.3 main 115 V a.c.	13-216
No.2 pitot heater supply	No.3 main 115 V a.c.	13-216
No.2 static heater supply	'B' main 26 V a.c.	13-216
No.2 total temp. heater supply	No.3 main 115 V a.c.	13-216
Engine T1 probe heaters		
No.1 heaters indication	'A' essential 28 V d.c.	1-213
No.1 engine heater supply	No.2 main 115 V a.c.	13-215
No.2 engine heater supply	No.1 main 115 V a.c.	14-215
No.2 heaters indication	'B' essential 28 V d.c.	3-213
No.3 engine heater supply	No.4 main 115 V a.c.	14-216

SERVICE	BUSBAR	CIRCUIT BREAKER PANEL
No.4 engine heater supply	No.3 main 115 V a.c.	13-216
Standby probe heater		
Standby caption light supply	'A' essential 28 V d.c.	1-213
Standby pitot heater supply	No.1 essential 115 V a.c.	2-213
Pressurization static vent heaters		
No.1 heaters supply	'A' main 28 V d.c.	15-215
No.2 heaters supply	'B' main 28 V d.c.	15-216

Electrical Power Supplies
Table 3

8. System Management (Ref. Fig. 008)

With electrical power available, the systems can be checked using the controls and indicators as directed on the illustration.



System Management
Figure 008

PITOT AND STATIC - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. paras.3., 4., 5. and 6.), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

Where circuits are similar for LH and RH systems or for Nos.1, 2, 3 and 4 systems, a single trouble shooting procedure is provided and references to all associated components listed in Table 101 are given, e.g., 'check for 115 V a.c. output at CB (15) to (18)' or 'renew Switch (73) or (74)'. These references are presented in the following sequence: LH, RH; 1, 2, 3, 4; P, S, alpha, beta, Tt.

Throughout the trouble shooting procedures, equipment identifications are provided unbracketed for the left system and bracketed for the right system.

2. Preparation

A. Remove the protective covers from the appropriate probes, vents and sensors.

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B. Make available electrical ground power as detailed in 24-41-00.

NOTE: The STBY and T1 captions on the warning lights module (panel 4-211) are normally illuminated with ground power applied and the associated heaters inoperative.

C. Ensure that the associated circuit breakers are set (Ref. Table 101).

NOTE: CBs (1) to (14) for ADS heaters.

CBs (2), (9) and (15) to (18) for T1 probe heaters.

CBs (19) and (20) for the standby probe heater.

CBs (21) and (22) for the pressurization static vent heaters.

3. Trouble Shooting - ADS Heaters

CAUTION: DO NOT LEAVE THE PROBE HEATERS SWITCHES IN THE "ON" POSITION FOR LONGER THAN 10 s; PROLONGED USE OF THE Tt PROBE HEATERS COULD CAUSE THE ASSOCIATED AIR DATA COMPUTERS TO BE DERANGED.

```
A.*******************************************
  *Prepare to trouble shoot (Ref. para.2.). *
  *Ensure that the ADS 1 (ADS 2) probe      *
  *heaters switch (panel 4-211) is in the   *
  *OFF position, then set the ADC 1 (ADC 2) *
  *master switch (panel 9-211) to the "ON"
  *position.  Check that all the LH (RH) ADS*
  *captions on the warning lights module    *
  *(P, S, alpha, beta and Tt) are           *
  *illuminated.  IF -                       *
  *******************************************
            |    |
            |    |      ----------------------------------
            |    |     |1. All LH (RH) ADS captions not    |
            OK   NOT OK------|   illuminated with heaters  |
            |          |   switched off - Chart 101.       |
            |          |2. All LH (RH) ADS captions except |
            |          |   P caption not illuminated with  |
            |          |   heaters switched off - Chart 102|
            |           ----------------------------------
            |
B.********************************************
  *Set the ADC 1 - TEST (ADC 2 - TEST)       *
  *selector switch (panel 9-211) to the "1"  *
  *position and the ADS 1(ADS 2) probe       *
  *heaters switch (panel 4-211) to the "Tt   *
  *INHIB" position.  Allow time for the ADC  *
  *to stabilize, then check that all the ADS *
  *captions except the Tt caption are        *
  *extinguished.  Check also that both       *
  *associated static vents are heating up.   *
  *IF -                                      *
  ********************************************
            |    |
            |    |      ----------------------------------
            |    |     |1. Individual ADS caption not      |
            OK   NOT OK------|   extinguished with heaters |
            |          |   switched on - Chart 103.        |
            |          |2. Individual static vent not      |
            |          |   heating up - renew Static Vent  |
            |          |   (24), (25) or (30), (31).       |
```

```
                                   |3. LH (RH) Tt caption extinguished |
                                   |   with probe heaters switch at     |
                                   |   "Tt INHIB" position - Chart 104.|
                                   |4. LH (RH) S, alpha and beta        |
                                   |   captions not extinguished with   |
                                   |   heaters switched on - Chart 105.|
                                   |5. LH (RH) P, S, alpha and beta     |
                                   |   captions not extinguished with   |
                                   |   heaters switched on - Chart 106.|
                                    ----------------------------------

C.********************************************
  *Set the ADS 1(ADS 2) probe heaters switch *
  *to the "ON" position and check that all   *
  *the ADS captions are extinguished;  return*
  *the probe heaters switch to the "Tt INHIB"*
  *position within 10 s.  IF -               *
  ********************************************
            |    |
            |    |                  ----------------------------------
            |    |                 |Individual ADS caption not        |
           OK   NOT OK------|extinguished with heaters switched |
            |                      |on - Chart 103.                   |
            |                       ----------------------------------
D.*******************************************
  *Set the ADC 1 - TEST (ADC 2 - TEST)      *
  *selector switch to the "2" position.     *
  *Allow time for the ADC to stabilize, then*
  *press the TEST push-switch on the warning*
  *lights module and check that the LH (RH) *
  *Tt caption is illuminated.  IF -         *
  *******************************************
                 |
                 |                  ----------------------------------
                 |                 |Tt caption not illuminated when   |
                NOT OK------|TEST push-switch is pressed -     |
                                   |Chart 107.                        |
                                    ----------------------------------
```

4. Trouble Shooting - T1 Probe Heaters

WARNING: OBSERVE THE SAFETY PRECAUTIONS DETAILED IN CHAPTER 71 WHEN OPERATING HP VALVE SWITCHES.

```
A.********************************************
  *Prepare to trouble shoot (Ref. para.2.).  *
  *Ensure that the LH (RH) HP VALVE switches *
  *(panel 4-211) are in the CLOSED position, *
  *then check that the associated T1 captions*
  *are illuminated.  IF -                    *
  ********************************************
                |    |
                |    |    ----------------------------------
                |    |   |1. Individual T1 caption not      |
                OK   NOT OK------|   illuminated with HP VALVE switch|
                |        |   in CLOSED position - Chart 108. |
                |        |2. LH (RH) T1 captions not        |
                |        |   illuminated with HP VALVE      |
                |        |   switches in CLOSED position -  |
                |        |   Chart 109.                     |
                |         ----------------------------------
                |
B.********************************************
  *Set the LH (RH) HP VALVE switches to the  *
  *"OPEN" position and check that the        *
  *associated T1 captions are extinguished.  *
  *IF -                                      *
  ********************************************
                     |
                     |    ----------------------------------
                     |   |Individual T1 caption illuminated |
                     NOT OK------|with HP VALVE switch in the OPEN |
                         |position - Chart 110.             |
                          ----------------------------------
```

5. Trouble Shooting - Standby Probe Heater

```
A.*******************************************
  *Prepare to trouble shoot (Ref. para.2.).  *
  *Ensure that the STBY heater switch (panel *
  *4-211) is set to the OFF position, then   *
  *check that the STBY caption on the warning*
  *lights module is illuminated.  IF -       *
  ********************************************
           |    |
           |    |                -----------------------------------
           |    |               |STBY caption not illuminated with  |
           OK   NOT OK----------|STBY heater switch in the OFF      |
           |                    |position - Chart 111.              |
           |                     -----------------------------------
           |
B.*******************************************
  *Set the STBY heater switch to the "ON"    *
  *position and check that the STBY caption  *
  *is extinguished.  IF -                    *
  ********************************************
                |
                |                -----------------------------------
                |               |STBY caption illuminated with STBY |
                NOT OK----------|heater switch in the ON position   |
                                |- Chart 112.                       |
                                 -----------------------------------
```

6. Trouble Shooting - Pressurization Static Vent Heaters

```
A.*******************************************
  *Prepare to trouble shoot (Ref. para.2.). *
  *Set the No.1 (2) PRESS STATIC HEATER     *
  *switch (panel 4-211) to the "ON"         *
  *position and check by hand that          *
  *pressurization static vents S11,S13 and  *
  *S15 (S10 and S14) heat up.  IF -         *
  *******************************************
                  |
                  |             ------------------------------------
                  |            |1. Individual heater inoperative    |
                  NOT OK------|    with heaters switched on - renew|
                               |   Static Vent (40) to (44).        |
                               |2. All heaters inoperative in No.1  |
                               |   (2) pressurization static vent   |
                               |   system with heaters switched on  |
                               |   - Chart 113.                     |
                                ------------------------------------
```

****
*ALL LH (RH) 'ADS' CAPTIONS *
R *NOT ILLUMINATED WITH HEATERS *
*SWITCHED OFF. *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

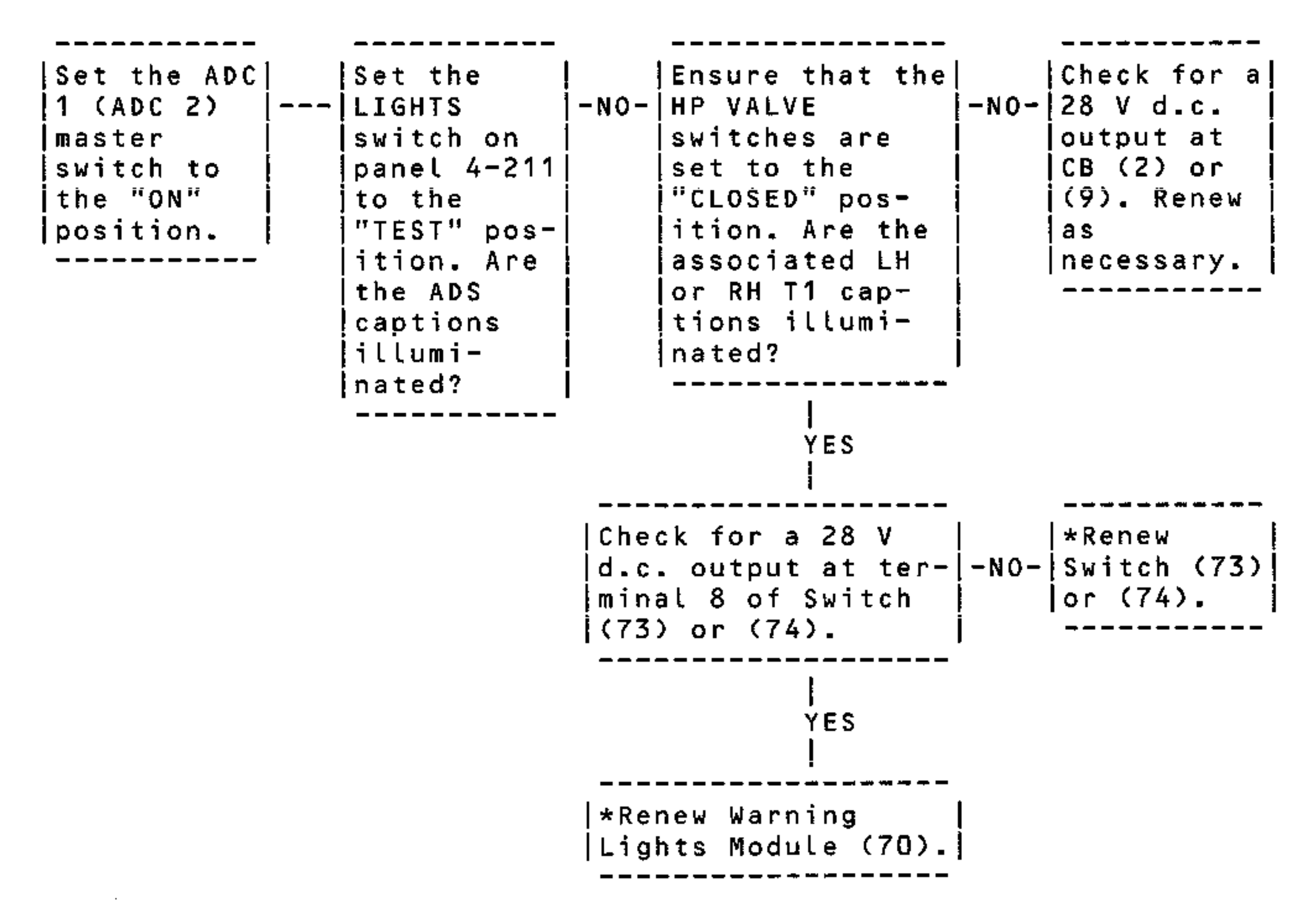


Chart 101

ALL LH (RH) 'ADS' CAPTIONS EXCEPT 'P' CAPTION NOT ILLUMINATED WITH HEATERS SWITCHED OFF.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

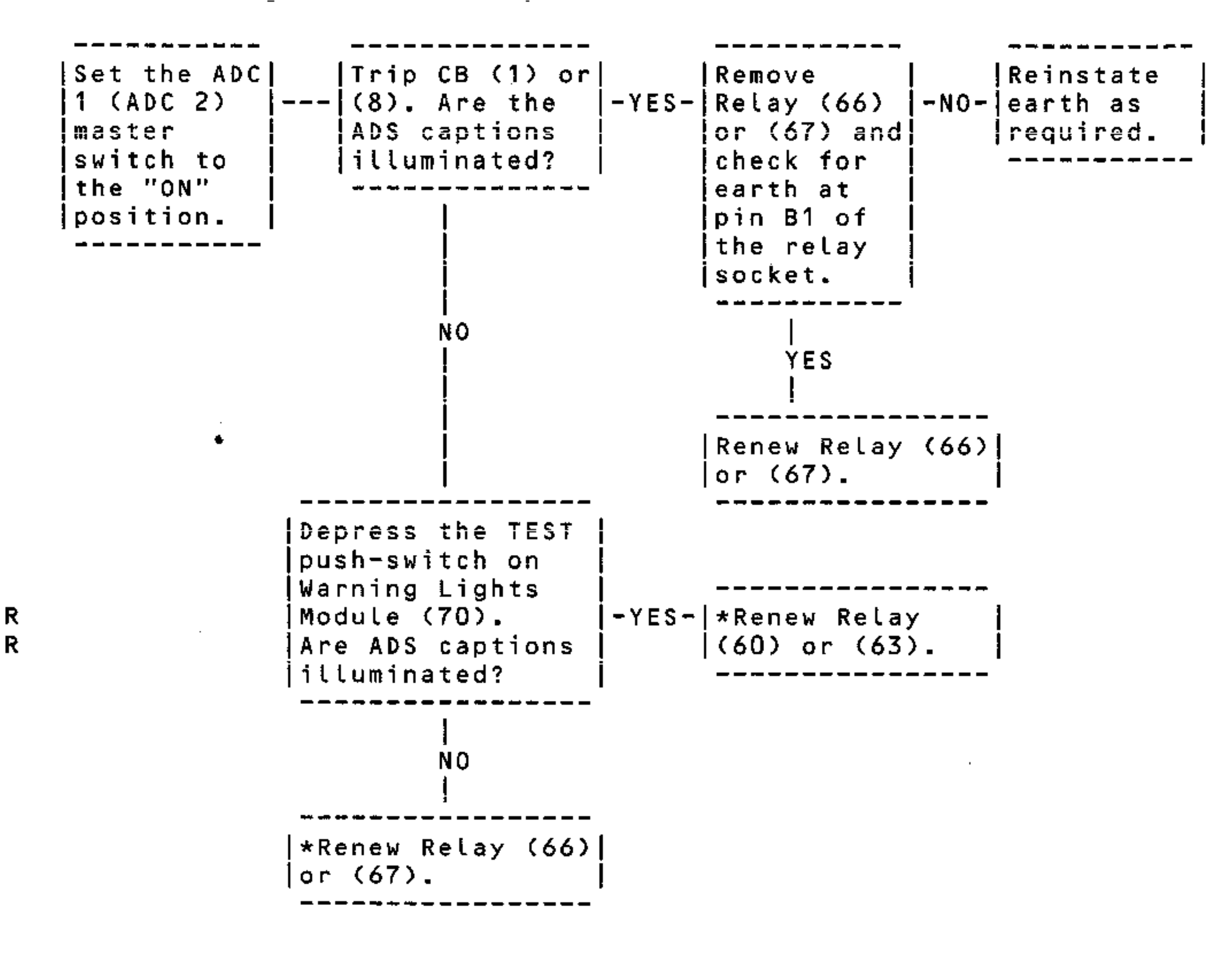


Chart 102

```
********************************
*INDIVIDUAL 'ADS' CAPTION NOT  *
*EXTINGUISHED WITH HEATERS     *
*SWITCHED ON.                  *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set the ADC 1 - TEST (ADC 2 - TEST) selector switch to "1" and the ADS 1 (ADS 2) probe heaters switch to "Tt INHIB" or "ON".

--- Return the probe heaters switch to "OFF", then check for an a.c. output at CB (3) to (7) or (10) to (14) - all 115 V except (4) and (11), which are 26 V.

-NO- Renew CB.

YES

Check for continuity between aircraft earth and terminal B of Current Sensor (45) to (49) or (50) to (54).

-NO- *Renew the Probe, both Vents or the Sensor (23) to (28) or (29) to (34).

YES

With the probe heaters switch set to ON (to check Tt heater only, 10 s maximum) or Tt INHIB, check for a.c. supply at terminal A of Current Sensor - all 115 V except (46) and (51), which are 26 V.

-NO- *Renew the associated Relay (60) to (65).

YES

*Renew Current Sensor (45) to (49) or (50) to (54).

Chart 103

****
*LH (RH) 'Tt' CAPTION *
*EXTINGUISHED WITH PROBE *
*HEATERS SWITCH AT 'Tt INHIB' *
*POSITION. *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

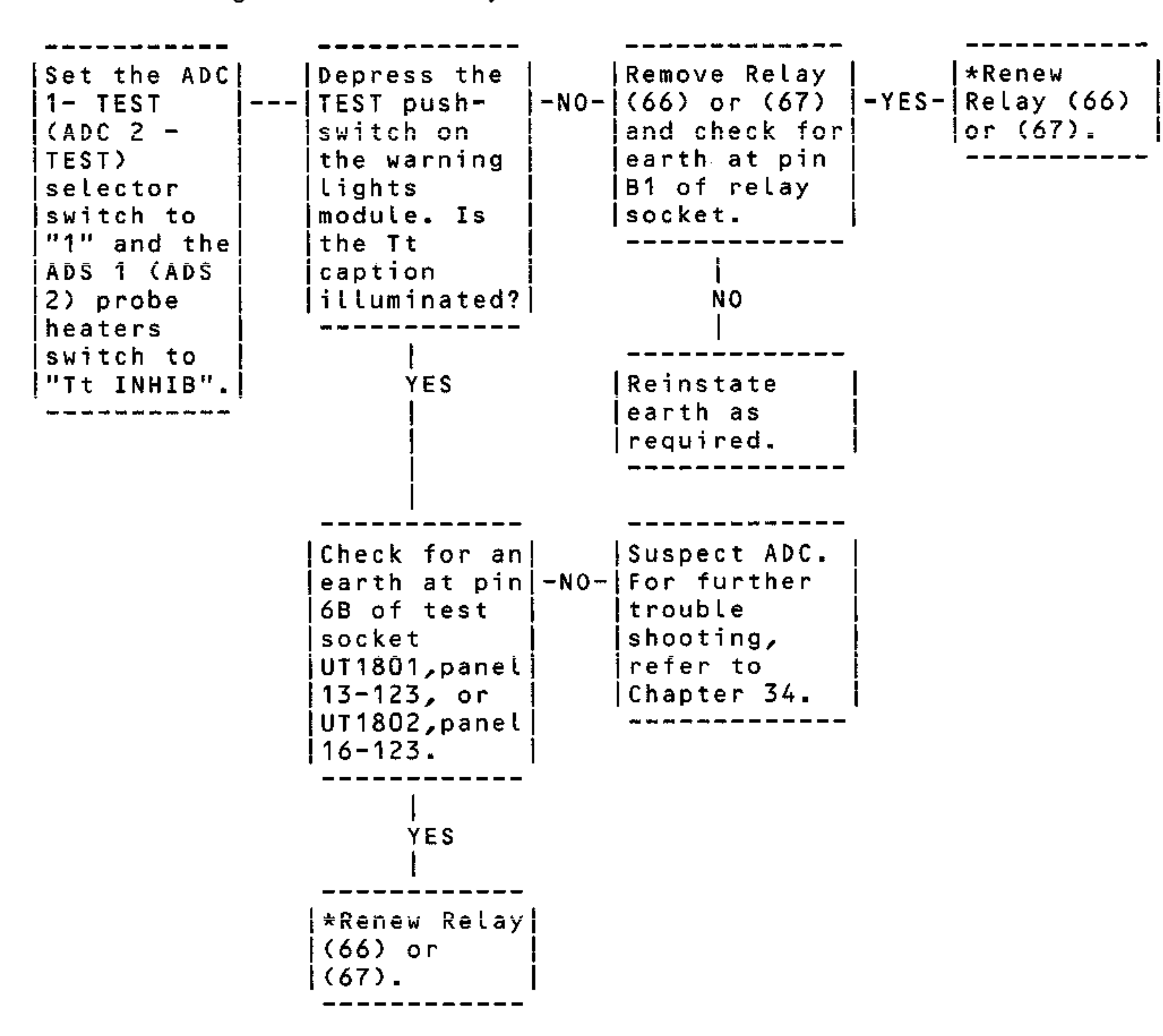


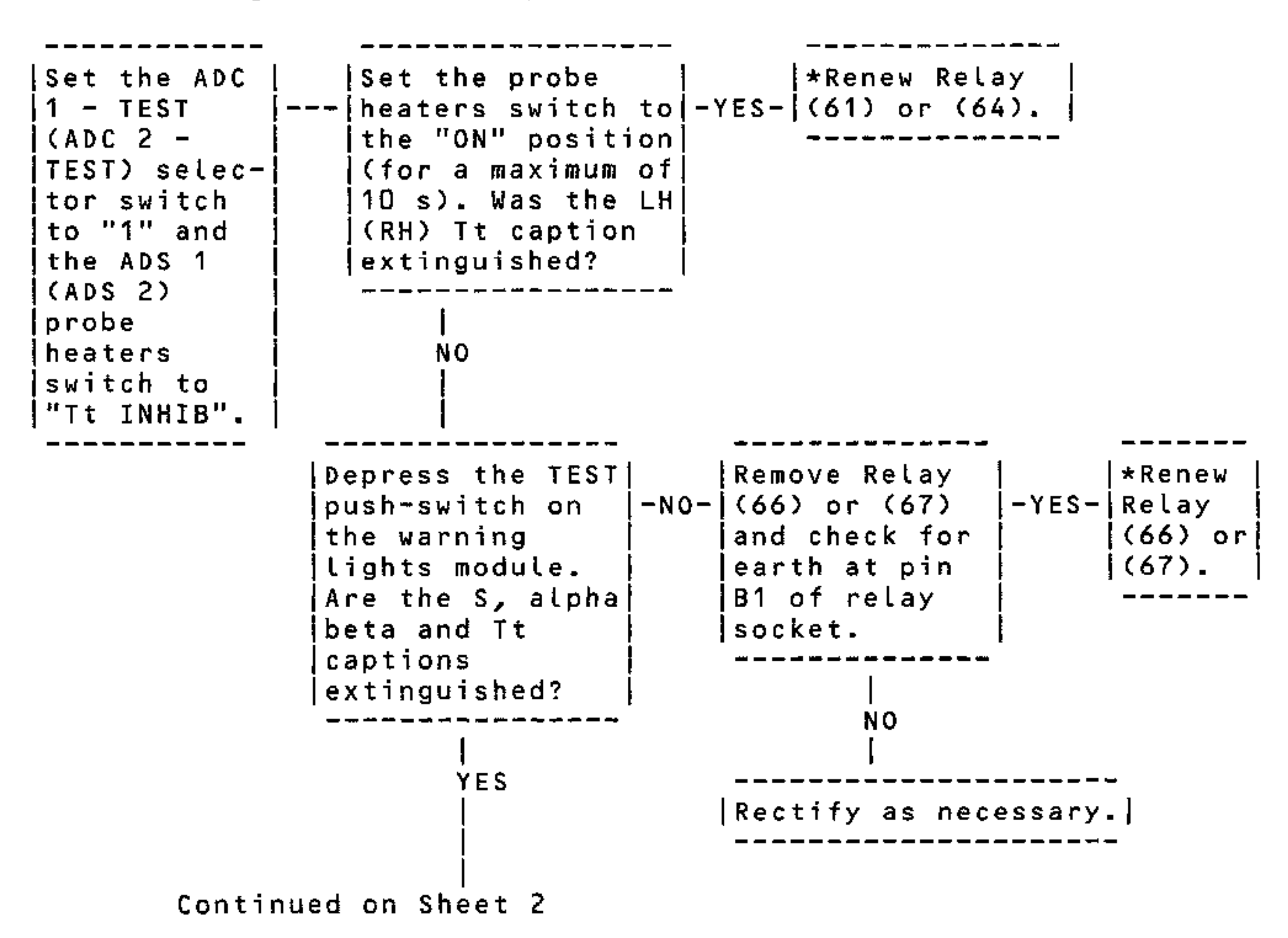
Chart 104

Printed in England

LH (RH) 'S', 'ALPHA' AND 'BETA' CAPTIONS NOT EXTINGUISHED WITH HEATERS SWITCHED ON.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.



Continued on Sheet 2

Chart 105 (Sheet 1 of 2)

Continued from Sheet 1

```
 ---------------------
|Check for an earth   |
|at pin 6B of test    |      ---------------------
|socket UT1801, panel |     |Suspect ADC. For     |
|13-123, or UT1802,   |-NO-|further trouble      |
|panel 16-123.        |     |shooting refer to    |
 ---------------------      |Chapter 34.          |
          |                  ---------------------
         YES
          |
 --------------------------
|*Renew Relay (66) or (67).|
 --------------------------
```

Chart 105 (Sheet 2 of 2)

```
*******************************
*LH (RH) 'P', 'S', 'ALPHA'    *
*AND 'BETA' CAPTIONS NOT      *
*EXTINGUISHED WITH HEATERS    *
*SWITCHED ON.                 *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 ----------------     --------------------        -------------
|Set the ADC 1 -  |   |Set the probe heaters|     |*Renew Switch |
|TEST (ADC 2 -    |---|switch to the "ON"   |-YES-|(71) or (72). |
|TEST) selector   |   |position (for a      |      -------------
|switch to "1" and|   |maximum of 10 s). Are|
|the ADS 1 (ADS 2)|   |the captions         |
|probe heaters    |   |extinguished?        |
|switch to "Tt    |    --------------------
|INHIB".          |              |
 ----------------                NO
                                 |
                      --------------------        -------------
R                    |Check for 28 V d.c.  |      |*Renew Switch |
R                    |output from CB (1) or|-YES-|(71) or (72). |
                     |(8).                 |       -------------
                      --------------------
                                 |
                                 NO
                                 |
                      --------------------
R                    |Renew CB (1) or (8). |
                      --------------------
```

Chart 106

```
********************************
*'Tt' CAPTION NOT ILLUMINATED *
*WHEN TEST PUSH-SWITCH IS     *
*PRESSED.                     *
********************************
```

GROUND EQUIPMENT REQUIRED

DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 -----------------       ---------------------          --------------
|Set the ADC 1 -  |     |Remove Relay (66) or |        |*Renew Relay  |
|TEST (ADC 2 -    |-----|(67) and, with the   |-YES-   |(66) or (67). |
|TEST) selector   |     |TEST push-switch     |         --------------
|switch to "2" and|     |depressed, check for |
|press the TEST   |     |earth at pin D3 of   |
|push-switch.     |     |the relay socket.    |
 -----------------       ---------------------
                                   |
                                   NO
                                   |
                         ---------------------          --------------
R                       |Is an earth present  |        |*Renew Warning|
R                       |at pin D3 of the     |-YES-   |Lights Module |
R                       |other Relay, (66) or |        |(70).         |
R                       |(67), with the TEST  |         --------------
R                       |push-switch          |
R                       |depressed?           |
                         ---------------------
                                   |
R                                  NO
                                   |
                         ---------------------
R                       |Check that flying    |
R                       |lead 22 of Warning   |
R                       |Lights Module (70) is|
R                       |correctly earthed.   |
R                       |If it is, renew the  |
R                       |Module (70).         |
                         ---------------------
```

Chart 107

****
*INDIVIDUAL 'T1' CAPTION NOT *
*ILLUMINATED WITH 'HP VALVE' *
*SWITCH IN 'CLOSED' POSITION. *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

R R
Ensure that the LH (RH) HP VALVE switches are in the CLOSED position.

Set the LIGHTS switch (panel 4-211) to the "TEST" position and check that, among others, the T1 caption is illuminated.

-YES- *Renew Current Sensor (55) to (58).

NO

Renew caption filaments.

Chart 108

LH (RH) 'T1' CAPTIONS NOT ILLUMINATED WITH 'HP VALVE' SWITCHES IN 'CLOSED' POSITION.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Ensure that the LH (RH) HP VALVE switches are in the CLOSED position.

Set the ADC 1 (ADC 2) master switch to the "ON" position. Are the associated LH (RH) ADS captions illuminated?

- YES: *Renew Warning Lights Module (70).
- NO: Check for 28 V d.c. output at CB (2) or (9). Renew as necessary.

Chart 109

INDIVIDUAL 'T1' CAPTION ILLUMINATED WITH 'HP VALVE' SWITCH IN THE 'OPEN' POSITION.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set the LH (RH) HP VALVE switches to the "OPEN" position.

Check for 115 V a.c. output at CB (15) to (18).
- NO: Renew CB (15) to (18).
- YES: Trip CB and check for continuity between aircraft earth and terminal B of Current Sensor (55) to (58).
  - NO: *Renew Probe (35) to (38).
  - YES: Reset CB and check for 115 V at terminal A of Current Sensor (55) to (58).
    - NO: Suspect HP fuel valve relay. For further trouble shooting, refer to 71-00-53.
    - YES: Renew Current Sensor (55) to (58).

Chart 110

R *'STBY' CAPTION NOT ILLUMINATED WITH 'STBY' HEATER SWITCH IN THE 'OFF' POSITION.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

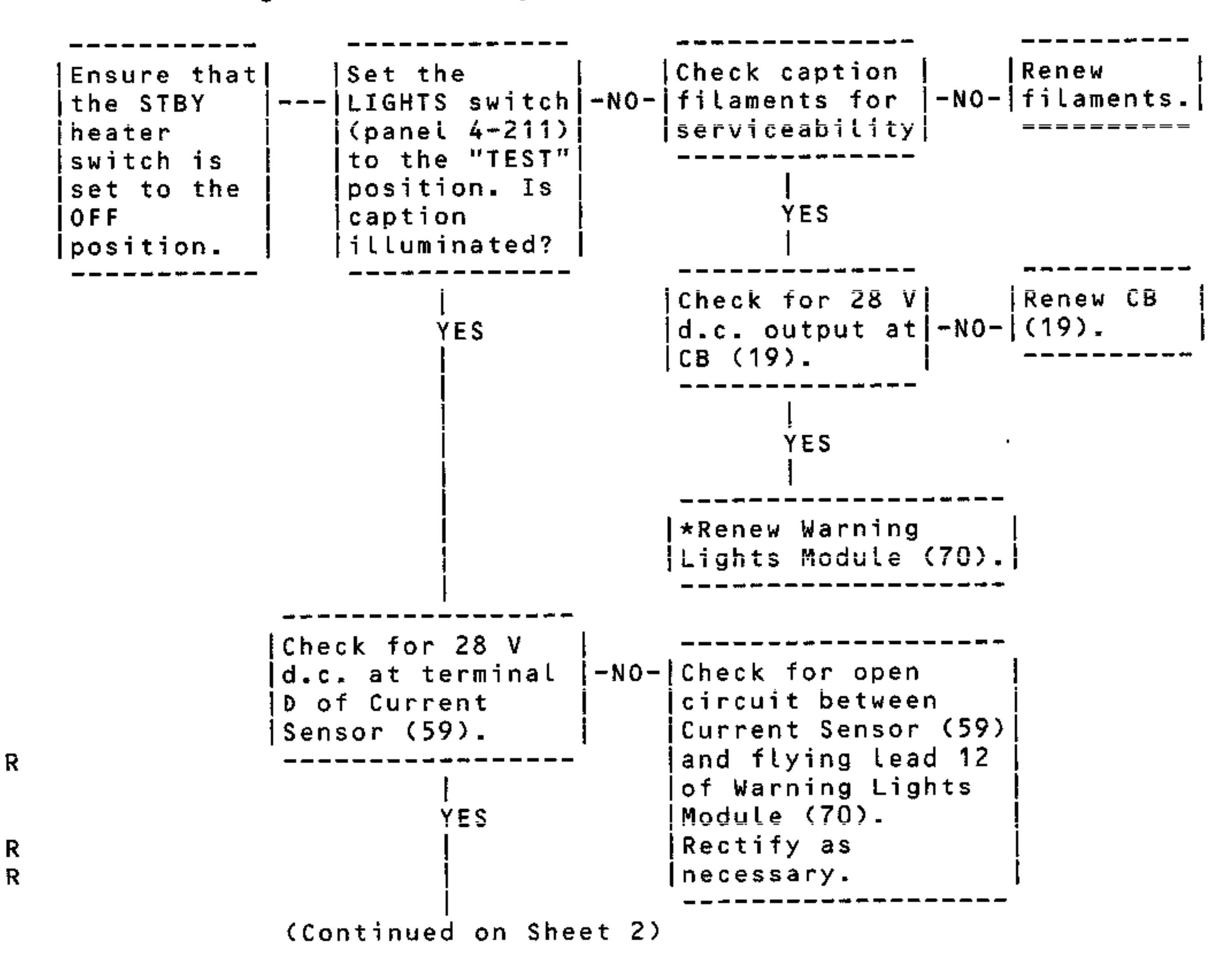


Chart 111 (Sheet 1 of 2)

(Continued from Sheet 1)

```
          |
 -----------------
|Trip CB (19),    |       -------------------
|then check for   |-NO-|Reinstate earth as |
|earth at terminal|    |necessary.         |
|C of Current     |     -------------------
|Sensor (59).     |
 -----------------
          |
         YES
          |
 -----------------
|Renew Current    |
|Sensor (59).     |
 -----------------
```

Chart 111 (Sheet 2 of 2)

```
*******************************
*'STBY' CAPTION ILLUMINATED   *
*WITH 'STBY' HEATER SWITCH IN *
*THE 'ON' POSITION.           *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

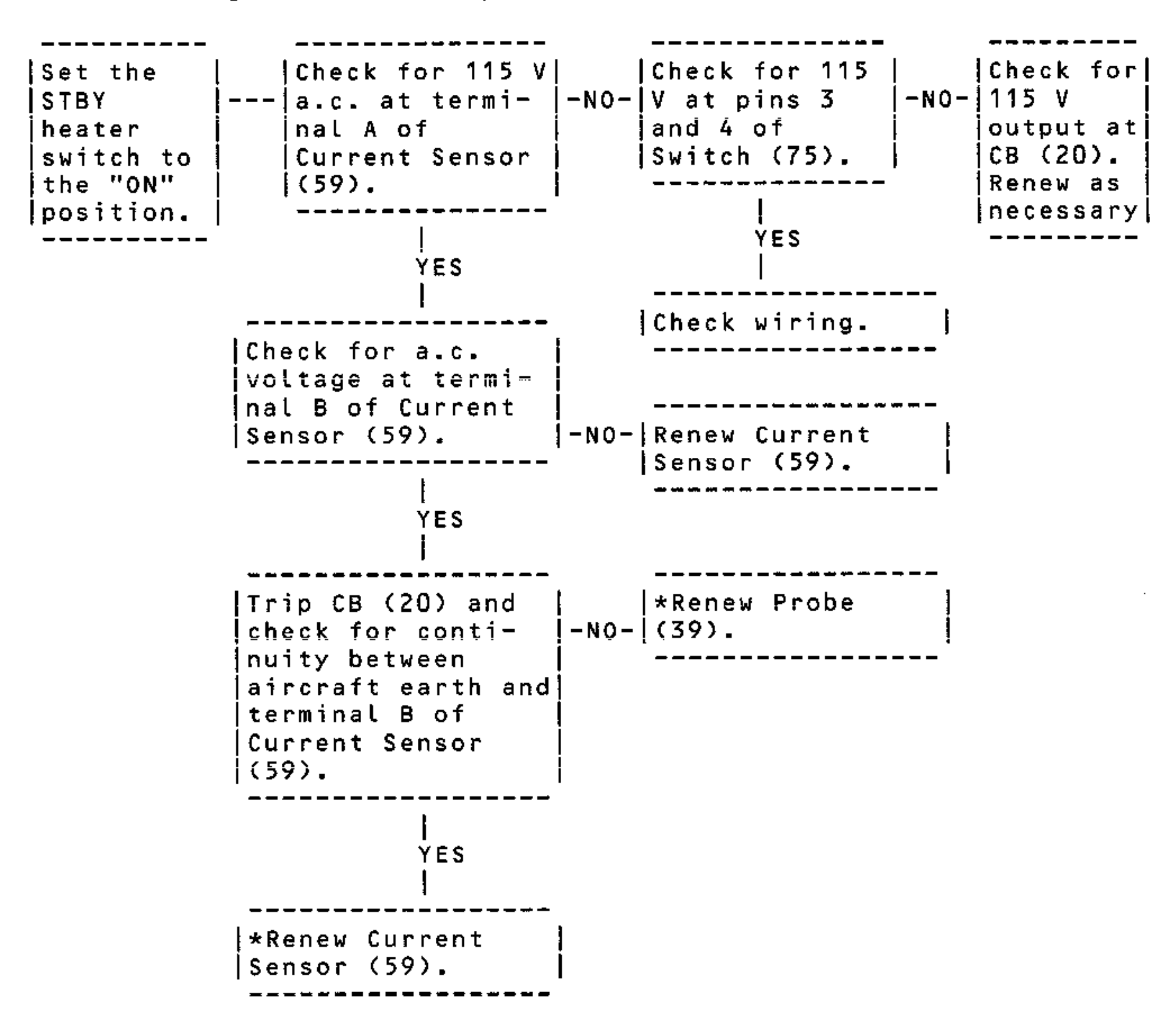


Chart 112

****
*ALL HEATERS INOPERATIVE IN *
R *NO.1 (2) PRESSURIZATION *
R *STATIC VENT SYSTEM WITH *
*HEATERS SWITCHED ON. *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

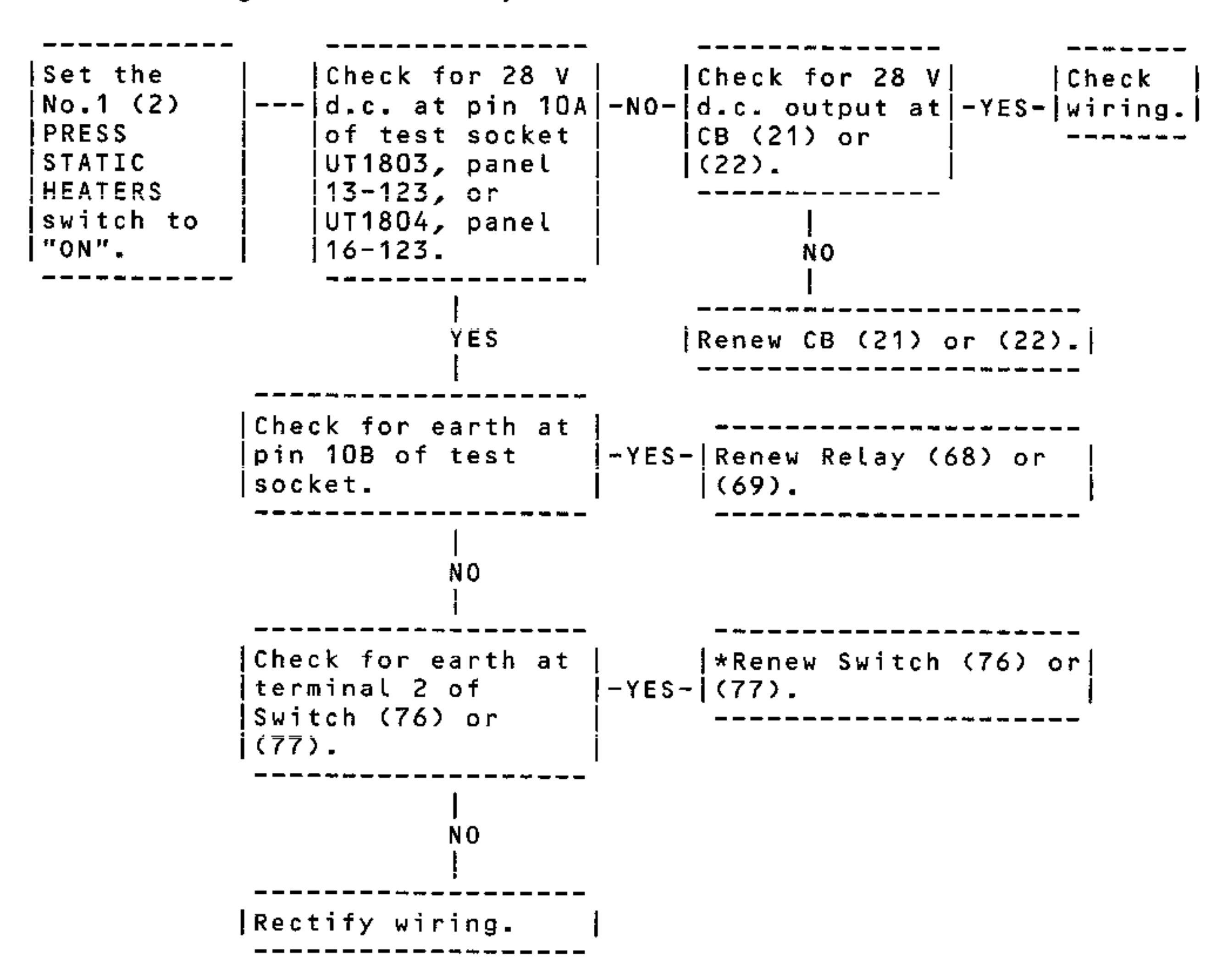


Chart 113

R **ON A/C 006-007,

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(1) Circuit breaker 28 V	-	1-213	1H1	Map ref.K8	24-50-00 R/I	30-31-01
(2) Circuit breaker 28 V	-	1-213	1H2	Map ref.K9	24-50-00 R/I	30-31-01
(3) Circuit breaker 26 V	-	2-213	1H3	Map ref.F22	24-50-00 R/I	30-31-01
(4) Circuit breaker 115 V	-	13-215	1H18	Map ref.D9	24-50-00 R/I	30-31-01
(5) Circuit breaker 115 V	-	2-213	1H5	Map ref.F24	24-50-00 R/I	30-31-01
(6) Circuit breaker 115 V	-	2-213	1H4	Map ref.F23	24-50-00 R/I	30-31-01
(7) Circuit breaker 115 V	-	2-213	1H21	Map ref.G24	24-50-00 R/I	30-31-01
(8) Circuit breaker 28 V	-	3-213	2H1	Map ref.A11	24-50-00 R/I	30-31-02
(9) Circuit breaker 28V	-	3-213	2H2	Map ref.A12	24-50-00 R/I	30-31-02
(10) Circuit breaker 115 V	-	13-216	2H3	Map ref.D11	24-50-00 R/I	30-31-02
(11) Circuit breaker 26 V	-	13-216	2H18	Map ref.C12	24-50-00 R/I	30-31-02
(12) Circuit breaker 115 V	-	13-216	2H5	Map ref.D12	24-50-00 R/I	30-31-02
(13) Circuit breaker 115 V	-	13-216	2H4	Map ref.D10	24-50-00 R/I	30-31-02
(14) Circuit breaker 115 V	-	13-216	2H21	Map ref.B11	24-50-00 R/I	30-31-02
(15) Circuit	-	13-215	1H542	Map ref.C9	24-50-00	30-31-71

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
breaker 115 V					R/I	
(16) Circuit breaker 115 V	-	14-215	2H542	Map ref.E8	24-50-00 R/I	30-31-71
(17) Circuit breaker 115 V	-	14-216	3H542	Map ref.C14	24-50-00 R/I	30-31-72
(18) Circuit breaker 115 V	-	13-216	4H542	Map ref.C11	24-50-00 R/I	30-31-72
(19) Circuit breaker 28 V	-	1-213	H122	Map ref.J10	24-50-00 R/I	30-31-31
(20) Circuit breaker 115 V	-	3-213	H121	Map ref.F18	24-50-00 R/I	30-31-31
(21) Circuit breaker 28 V	-	15-215	H491	Map ref.G10	24-50-00 R/I	30-31-51
(22) Circuit breaker 28 V	-	15-216	H492	Map ref.D17	24-50-00 R/I	30-31-52
(23) No.1 pitot probe	-	113	1H16	Left nose	34-11-34 R/I	30-31-01
(24) Static vent (S17)	-	123	1H19	Left fwd. belly	34-**-** R/I	30-31-01
(25) Static vent (S18)	-	124	1H20	Right fwd. belly	34-**-** R/I	30-31-01
(26) No.1 incidence sensor	-	113	1F91	Left fwd. fuselage	34-11-31 R/I	34-11-03
(27) No.1 sideslip sensor	-	123	1F92	Fwd. belly centre line	34-12-11 R/I	34-12-01
(28) No.1 total temperature probe	-	113	1F98	Left nose	34-11-32 R/I	34-11-03

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(29) No.2 pitot probe	-	114	2H16	Right nose	34-11-34 R/I	30-31-02
(30) Static vent (S19)	-	123	2H19	Left fwd. belly	34-**-** R/I	30-31-02
(31) Static vent (S16)	-	124	2H20	Right fwd. belly	34-**-** R/I	30-31-02
(32) No.2 incidence sensor	-	114	2F91	Right fwd. fuselage	34-11-31 R/I	34-11-08
(33) No.2 sideslip sensor	-	124	2F92	Fwd. belly centre line	34-12-11 R/I	34-12-02
(34) No.2 total temperature probe	=	114	2F98	Right nose	34-11-32 R/I	34-11-08
(35) No.1 engine T1 probe	-	411	1K24	Intake 1	76-11-14 R/I	30-31-71
(36) No.2 engine T1 probe	-	421	2K24	Intake 2	76-11-14 R/I	30-31-71
(37) No.3 engine T1 probe	-	431	3K24	Intake 3	76-11-14 R/I	30-31-72
(38) No.4 engine T1 probe	-	441	4K24	Intake 4	76-11-14 R/I	30-31-72
(39) Standby probe	-	111	H125	Nose	34-11-33 R/I	30-31-31
(40) Pressurization static vent (S11)	-	123	H505	Left fwd. belly	21-35-14 R/I	30-31-51

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(41) Pressur-ization static vent (S13)	-	123	H499	Left fwd. belly	21-35-14 R/I	30-31-51
(42) Pressur-ization static vent (S15)	-	151	H501	Aft belly centre line	21-35-14 R/I	30-31-51
(43) Pressur-ization static vent (S10)	-	124	H500	Right fwd. belly	21-35-14 R/I	30-31-52
(44) Pressur-ization static vent (S14)	-	152	H502	Aft belly centre line	21-35-14 R/I	30-31-52
(45) AC current sensor (P No.1)	-	21-123	1H10	U/floor racking	30-00-00 R/I	30-31-01
(46) AC current sensor (S No.1)	-	21-123	1H25	U/floor racking	30-00-00 R/I	30-31-01
(47) AC current sensor (alpha No.1)	-	21-123	1H12	U/floor racking	30-00-00 R/I	30-31-01
(48) AC current sensor (beta No.1)	-	21-123	1H11	U/floor racking	30-00-00 R/I	30-31-01
(49) AC current sensor (Tt No.1)	-	21-123	1H23	U/floor racking	30-00-00 R/I	30-31-01
(50) AC current sensor (P No.2)	-	23-123	2H10	U/floor racking	30-00-00 R/I	30-31-02
(51) AC current sensor (S No.2)	-	23-123	2H25	U/floor racking	30-00-00 R/I	30-31-02
(52) AC current sensor (alpha No.2)	-	23-123	2H12	U/floor racking	30-00-00 R/I	30-31-02
(53) AC current	-	23-123	2H11	U/floor	30-00-00	30-31-02

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ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
sensor (beta No.2)				racking	R/I	
(54) AC current sensor (Tt No.2)	-	23-123	2H23	U/floor racking	30-00-00 R/I	30-31-02
(55) AC current sensor (1T1)	-	1-131	1H544	Baggage compt.	30-00-00 R/I	30-31-71
(56) AC current sensor (2T1)	-	1-131	2H544	Baggage compt.	30-00-00 R/I	30-31-71
(57) AC current sensor (3T1)	-	1-132	3H544	Baggage compt.	30-00-00 R/I	30-31-72
(58) AC current sensor (4T1)	-	1-132	4H544	Baggage compt.	30-00-00 R/I	30-31-72
(59) AC current sensor (STBY)	-	23-123	H124	U/floor racking	30-00-00 R/I	30-31-31
(60) Power relay (P)	-	13-123	1H7	U/floor racking	30-00-00 R/I	30-31-01
(61) Power relay (S, alpha, beta)	-	13-123	1H8	U/floor racking	30-00-00 R/I	30-31-01
(62) Power relay (Tt)	-	13-123	1H22	U/floor racking	30-00-00 R/I	30-31-02
(63) Power relay (P)	-	16-123	2H7	U/floor racking	30-00-00 R/I	30-31-02
(64) Power relay (S, alpha, beta)	-	16-123	2H8	U/floor racking	30-00-00 R/I	30-31-02
(65) Power relay (Tt)	-	16-123	2H22	U/floor racking	30-00-00 R/I	30-31-02
(66) No.1 ADC slave relay	-	13-123	1H9	U/floor racking	30-00-00 R/I	30-31-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(67) No.2 ADC slave relay	-	16-123	2H9	U/floor racking	30-00-00 R/I	30-31-02
(68) Control relay	-	13-123	H497	U/floor racking	30-00-00 R/I	30-31-51
(69) Control relay	-	16-123	H498	U/floor racking	30-00-00 R/I	30-31-52
(70) Warning lights module	-	4-211	H24	Flt. compt. roof panel	30-31-11 R/I	30-31-01
(71) ADS 1 probe heaters switch	-	4-211	1H6	Flt. compt. roof panel	30-00-00 R/I	30-31-01
(72) ADS 2 probe heaters switch	-	4-211	2H6	Flt. compt. roof panel	30-00-00 R/I	30-31-02
(73) ADC 1 master switch	-	9-211	1F94	Flt. compt. centre console	34-11-** R/I	34-10-01
(74) ADC 2 master switch	-	9-211	2F94	Flt. compt. centre console	34-11-** R/I	34-10-01
(75) STBY heater switch	-	4-211	H123	Flt. compt. roof panel	30-00-00 R/I	30-31-31
(76) No.1 PRESS STATIC HEATER switch	-	4-211	H495	Flt. compt. roof panel	30-00-00 R/I	30-31-51
(77) No.2 PRESS STATIC HEATER switch	-	4-211	H496	Flt. compt. roof panel	30-00-00 R/I	30-31-52

Component Identification
Table 101

**ON A/C 001-005,

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ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(1) Circuit breaker 28 V	-	1-213	1H1	Map ref.K8	24-50-00 R/I	30-31-01
(2) Circuit breaker 28 V	-	1-213	1H2	Map ref.K9	24-50-00 R/I	30-31-01
(3) Circuit breaker 26 V	-	2-213	1H3	Map ref.F22	24-50-00 R/I	30-31-01
(4) Circuit breaker 115 V	-	13-215	1H18	Map ref.D9	24-50-00 R/I	30-31-01
(5) Circuit breaker 115 V	-	2-213	1H5	Map ref.F24	24-50-00 R/I	30-31-01
(6) Circuit breaker 115 V	-	2-213	1H4	Map ref.F23	24-50-00 R/I	30-31-01
(7) Circuit breaker 115 V	-	2-213	1H21	Map ref.G24	24-50-00 R/I	30-31-01
(8) Circuit breaker 28 V	-	3-213	2H1	Map ref.A11	24-50-00 R/I	30-31-02
(9) Circuit breaker 28 V	-	3-213	2H2	Map ref.A12	24-50-00 R/I	30-31-02
(10) Circuit breaker 115 V	-	13-216	2H3	Map ref.D12	24-50-00 R/I	30-31-02
(11) Circuit breaker 26 V	-	13-216	2H18	Map ref.C12	24-50-00 R/I	30-31-02
(12) Circuit breaker 115 V	-	13-216	2H5	Map ref.D13	24-50-00 R/I	30-31-02
(13) Circuit breaker 115 V	-	13-216	2H4	Map ref.D10	24-50-00 R/I	30-31-02
(14) Circuit breaker 115 V	-	13-216	2H21	Map ref.B11	24-50-00 R/I	30-31-02
(15) Circuit breaker 115 V	-	13-215	1H542	Map ref.C9	24-50-00 R/I	30-31-71

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(16) Circuit breaker 115 V	-	14-215	2H542	Map ref.E8	24-50-00 R/I	30-31-71
(17) Circuit breaker 115 V	-	14-216	3H542	Map ref.C14	24-50-00 R/I	30-31-72
(18) Circuit breaker 115 V	-	13-216	4H542	Map ref.C11	24-50-00 R/I	30-31-72
(19) Circuit breaker 28 V	-	1-213	H122	Map ref.J10	24-50-00 R/I	30-31-31
(20) Circuit breaker 115 V	-	3-213	H121	Map ref.F18	24-50-00 R/I	30-31-31
(21) Circuit breaker 28 V	-	15-215	H491	Map ref.G10	24-50-00 R/I	30-31-51
(22) Circuit breaker 28 V	-	15-216	H492	Map ref.D17	24-50-00 R/I	30-31-52
(23) No.1 pitot probe	-	113	1H16	Left nose	34-11-34 R/I	30-31-01
(24) Static vent (S17)	-	123	1H19	Left fwd. belly	34-**-** R/I	30-31-01
(25) Static vent (S18)	-	124	1H20	Right fwd. belly	34-**-** R/I	30-31-01
(26) No.1 incidence sensor	-	113	1F91	Left fwd. fuselage	34-11-31 R/I	34-11-03
(27) No.1 sideslip sensor	-	123	1F92	Fwd. belly centre line	34-12-11 R/I	34-12-01
(28) No.1 total temperature probe	-	113	1F98	Left nose	34-11-32 R/I	34-11-03
(29) No.2 pitot probe	-	114	2H16	Right nose	34-11-34 R/I	30-31-02

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(30) Static vent (S19)	-	123	2H19	Left fwd. belly	34-**-** R/I	30-31-02
(31) Static vent (S16)	-	124	2H20	Right fwd. belly	34-**-** R/I	30-31-02
(32) No.2 incidence sensor	-	114	2F91	Right fwd. fuselage	34-11-31 R/I	34-11-08
(33) No.2 sideslip sensor	-	124	2F92	Fwd. belly centre line	34-12-11 R/I	34-12-02
(34) No.2 total temperature probe	-	114	2F98	Right nose	34-11-32 R/I	34-11-08
(35) No.1 engine T1 probe	-	411	1K24	Intake 1	76-11-14 R/I	30-31-71
(36) No.2 engine T1 probe	-	421	2K24	Intake 2	76-11-14 R/I	30-31-71
(37) No.3 engine T1 probe	-	431	3K24	Intake 3	76-11-14 R/I	30-31-72
(38) No.4 engine T1 probe	-	441	4K24	Intake 4	76-11-14 R/I	30-31-72
(39) Standby probe	-	111	H125	Nose	34-13-33 R/I	30-31-31
(40) Pressurization static vent (S11)	-	123	H505	Left fwd. belly	21-35-14 R/I	30-31-51
(41) Pressurization static vent (S13)	-	123	H499	Left fwd. belly	21-35-14 R/I	30-31-51

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(42) Pressurization static vent (S15)	-	151	H501	Aft belly centre line	21-35-14 R/I	30-31-51
(43) Pressurization static vent (S10)	-	124	H500	Right fwd. belly	21-35-14 R/I	30-31-52
(44) Pressurization static vent (S14)	-	152	H502	Aft belly centre line	21-35-14 R/I	30-31-52
(45) AC current sensor (P No.1)	-	21-123	1H10	U/floor racking	30-00-00 R/I	30-31-01
(46) AC current sensor (S No.1)	-	21-123	1H25	U/floor racking	30-00-00 R/I	30-31-01
(47) AC current sensor (alpha No.1)	-	21-123	1H12	U/floor racking	30-00-00 R/I	30-31-01
(48) AC current sensor (beta No.1)	-	21-123	1H11	U/floor racking	30-00-00 R/I	30-31-01
(49) AC current sensor (Tt No.1)	-	21-123	1H23	U/floor racking	30-00-00 R/I	30-31-01
(50) AC current sensor (P No.2)	-	23-123	2H10	U/floor racking	30-00-00 R/I	30-31-02
(51) AC current sensor (S No.2)	-	23-123	2H25	U/floor racking	30-00-00 R/I	30-31-02
(52) AC current sensor (alpha No.2)	-	23-123	2H12	U/floor racking	30-00-00 R/I	30-31-02
(53) AC current sensor (beta No.2)	-	23-123	2H11	U/floor racking	30-00-00 R/I	30-31-02
(54) AC current	-	23-123	2H23	U/floor	30-00-00	30-31-02

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
sensor (Tt No.2)				racking	R/I	
(55) AC current sensor (1T1)	-	1-131	1H544	Baggage compt.	30-00-00 R/I	30-31-71
(56) AC current sensor (2T1)	-	1-131	2H544	Baggage compt.	30-00-00 R/I	30-31-71
(57) AC current sensor (3T1)	-	1-132	3H544	Baggage compt.	30-00-00 R/I	30-31-72
(58) AC current sensor (4T1)	-	1-132	4H544	Baggage compt.	30-00-00 R/I	30-31-72
(59) AC current sensor (STBY)	-	23-123	H124	U/floor racking	30-00-00 R/I	30-31-31
(60) Power relay (P)	-	13-123	1H7	U/floor racking	30-00-00 R/I	30-31-01
(61) Power relay (S, alpha, beta)	-	13-123	1H8	U/floor racking	30-00-00 R/I	30-31-01
(62) Power relay (Tt)	-	13-123	1H22	U/floor racking	30-00-00 R/I	30-31-01
(63) Power relay (P)	-	16-123	2H7	U/floor racking	30-00-00 R/I	30-31-02
(64) Power relay (S, alpha, beta)	-	16-123	2H8	U/floor racking	30-00-00 R/I	30-31-02
(65) Power relay (Tt)	-	16-123	2H22	U/floor racking	30-00-00 R/I	30-31-02
(66) No.1 ADC slave relay	-	13-123	1H9	U/floor racking	30-00-00 R/I	30-31-01
(67) No.2 ADC slave relay	-	16-123	2H9	U/floor racking	30-00-00 R/I	30-31-02
(68) Control relay	-	13-123	H497	U/floor racking	30-00-00 R/I	30-31-51

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(69) Control relay	-	16-123	H498	U/floor racking	30-00-00 R/I	30-31-52
(70) Warning lights module	-	4-211	H24	Flt. compt. roof panel	30-31-11 R/I	30-31-01
(71) ADS 1 probe heaters switch	-	4-211	1H6	Flt. compt. roof panel	30-00-00 R/I	30-31-01
(72) ADS 2 probe heaters switch	-	4-211	2H6	Flt. compt. roof panel	30-00-00 R/I	30-31-02
(73) ADC 1 master switch	-	9-211	1F94	Flt. compt. centre console	34-11-** R/I	34-10-01
(74) ADC 2 master switch	-	9-211	2F94	Flt. compt. centre console	34-11-** R/I	34-10-01
(75) STBY heater switch	-	4-211	H123	Flt. compt. roof panel	30-00-00 R/I	30-31-31
(76) No.1 PRESS STATIC HEATER switch	-	4-211	H495	Flt. compt. roof panel	30-00-00 R/I	30-31-51
(77) No.2 PRESS STATIC HEATER switch	-	4-211	H496	Flt. compt. roof panel	30-00-00 R/I	30-31-52

Component Identification
Table 101

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PITOT AND STATIC - ADJUSTMENT/TEST

WARNING: PRECAUTIONS MUST BE TAKEN TO PROTECT PERSONNEL FROM INADVERTENT CONTACT WITH HEATED PROBES, VENTS OR SENSORS.

OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

The following Functional Test proves the integrity of all the air data probe, vent and sensor heaters. Operational and System Tests are considered unnecessary in this application.

The left and right or numbered parts of various sub-systems included in this topic can be individually tested, using the common 'Prepare' and 'Conclusion' procedures. Alternatively, the parts of each sub-system can be tested together. References to the left or first-numbered part of each sub-system are provided unbracketed, the remainder bracketed.

2. Functional Test

A. Equipment and Materials

DESCRIPTION	PART NO.
ADC simulator	TE2045.000

NOTE: The ADC simulator is required for the ADS heater tests, but only if an air data computer is not available.

B. Prepare

(1) Remove the protective covers from the appropriate probes, vents and/or sensors.

(2) If the ADS heaters are to be tested and an air data computer is not available, install the ADC simulator (Ref. 34-11-00).

(3) Make available electrical ground power as detailed in 24-41-00.

NOTE: The STBY and T1 failure warning captions on the warning lights module (panel 4-211) are normally illuminated, with ground power applied and the heaters inoperative.

C. Test ADS Heaters

CAUTION: PROBE HEATERS SWITCHES MUST NOT BE SET TO THE 'ON' POSITION FOR LONGER THAN 10 s.

(1) Ensure that the ADS 1 (ADS 2) probe heaters switch on panel 4-211 is set to the OFF position.

(2) Set the ADC 1 (ADC 2) master switch on panel 9-211 to the "ON" position and check that all of the LH (RH) ADS failure warning captions (P, S, alpha, beta and Tt) are illuminated.

(3) Set the ADC 1 - TEST (ADC 2 - TEST) selector switch on panel 9-211 to the "1" position or set
R the ADC simulator total temperature control to
R +10 deg C.

(4) Allow time for the ADC to stabilize, then set the ADS 1 (ADS 2) probe heaters switch to the "Tt INHIB" position and check that all the LH (RH) ADS failure warning captions except Tt are extinguished.

(5) Set the ADS 1 (ADS 2) probe heaters switch to the "ON" position and check that all of the LH (RH) ADS failure warning captions are extinguished; return the switch to the "Tt INHIB" position within 10 s.

(6) Set the ADC 1 - TEST (ADC 2 - TEST) selector switch to the "2" position or set the ADC
R simulator total temperature control to +20 deg C; the ADS failure warning captions will be extinguished.

(7) Allow time for the ADC to stabilize, then check that the LH (RH) Tt failure warning caption is illuminated when the TEST push-switch on the warning lights module is pressed.

R (8) Return the ADS 1 (ADS 2) probe heaters switch to the "OFF" position, then return the ADC selector and master switches to the "NORM" and "OFF" positions respectively.

D. Test T1 Probe Heaters

WARNING: WHEN OPERATING 'HP VALVE' SWITCHES, OBSERVE THE SAFETY PRECAUTIONS DETAILED IN CHAPTER 71.

(1) Ensure that the No.1 (2, 3 or 4) HP VALVE switch on panel 4-211 is in the CLOSED position and check that the appropriate T1 failure warning caption on the warning lights module is illuminated.

R (2) Set the No.1 (2, 3 or 4) HP VALVE switch to the "OPEN" position, then check that the appropriate
R T1 failure warning caption is extinguished.

R (3) Return the No.1 (2, 3 or 4) HP VALVE switch to the
R "CLOSED" position.

E. Test Standby Probe Heater

(1) Ensure that the STBY heater switch on panel 4-211 is set to the OFF position, then check that the STBY failure warning caption on the warning lights module is illuminated.

(2) Set the STBY heater switch to the "ON" position and check that the STBY failure warning caption is extinguished, then return the switch to the "OFF" position.

R F. Test Pressurization Static Vent Heaters

(1) Set the No.1 (2) PRESS STATIC HEATERS switch on panel 4-211 to the "ON" position and, using caution, check by hand that static vents S11, S13 and S15 (S10 and S14) heat up.

R (2) Return the PRESS STATIC HEATERS switch to the "OFF" position.

G. Conclusion

(1) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(2) Remove the ADC simulator, if fitted.

(3) First ensuring that the heaters have cooled down, refit the protective covers to the appropriate probes, vents and/or sensors.

WARNING LIGHTS MODULE - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

CAUTION: ELECTROLUMINESCENT (EL) PANELS ARE EASILY DAMAGED, THEREFORE GREAT CARE MUST BE TAKEN NOT TO DAMAGE THEM WITH HAND TOOLS.

1. General

The warning lights module is rear-mounted on a rear switch panel that forms part of flight compartment roof panel 4-211. Electrical connection is by flying leads, which terminate at a switch near the module, a terminal block on the main frame of the roof panel and five plug-breaks located aft of the roof panel. However, with renewal of the module as described in this topic, all but one of the existing flying leads are left in situ, and the new flying leads are connected to them with in-line crimps.

2. Warning Lights Module (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Torq-set driver	-

B. Prepare

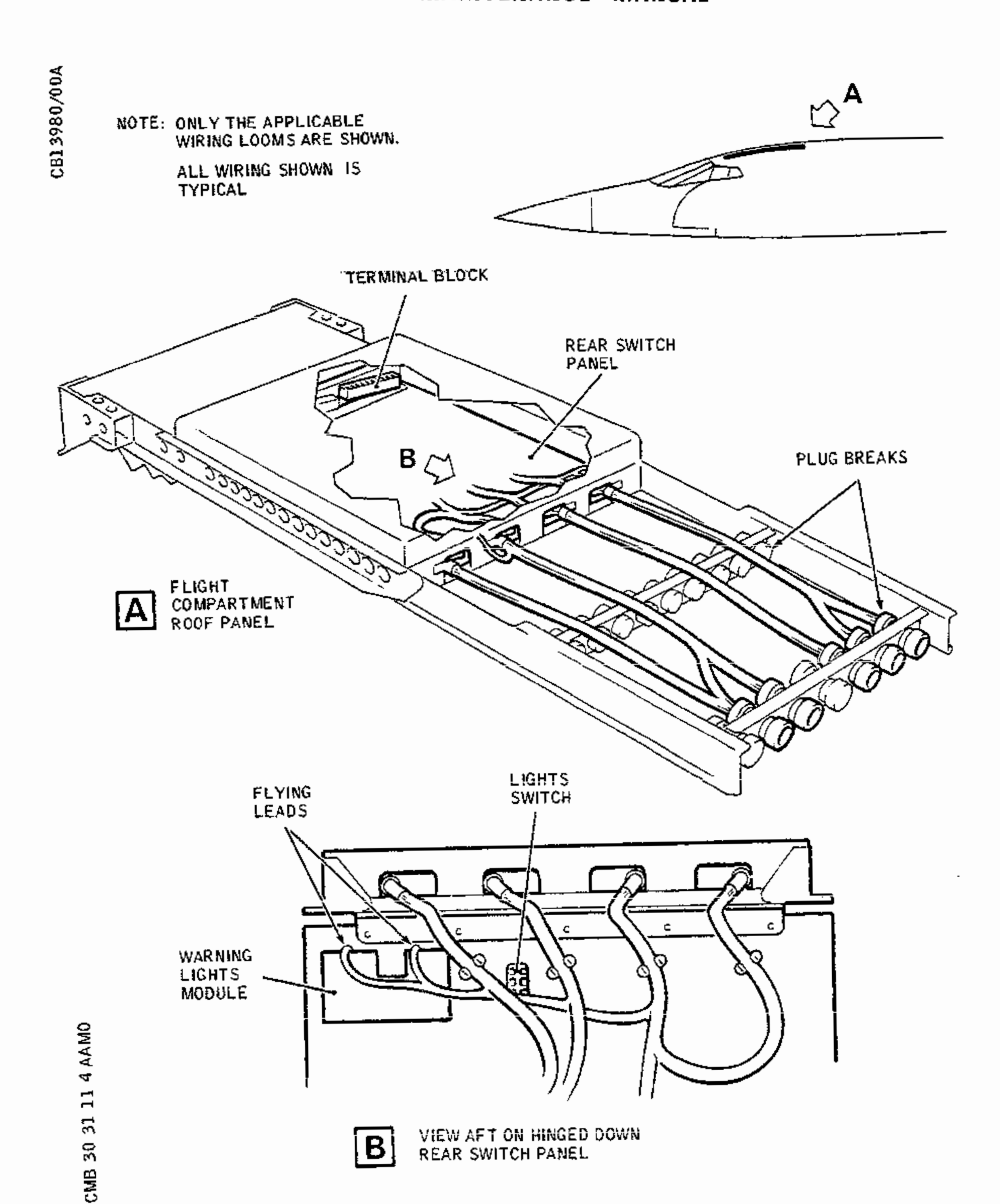
(1) Isolate the electrical generation and external power supplies as detailed in 24-00-00, Servicing.

NOTE: The next four operations provide access to the module securing screws.

(2) Identify the three LIGHTING rotary selector switches located slightly forward of the module, then remove the cap, unscrew the clutch nut and withdraw the knob from each switch.

(3) Carefully release and remove the guard rail from the rear switch panel, using the Torq-set driver to remove the attachment screws.

(4) Carefully release the EL panel surrounding the module, using the Torq-set driver to remove the



- Warning Lights Module - Typical Installation
Figure 401

attachment screws.

(5) Remove the EL panel by gently pulling it outward and disconnecting the coaxial connector. Stow the panel where it will not be damaged.

(6) Support the rear switch panel and release the quick-release fasteners securing it to the main frame of the roof panel. Lower the panel on its hinge, then unhook the check cord and allow the panel to hang freely.

C. Remove

(1) Cut the flying leads close to the module grommets.

(2) Support the module, remove the four securing screws, then remove the module.

NOTE: Electrical power may now be reinstated, if required for other services, provided -

(a) the cut cable-ends and the EL panel coaxial connector are suitably insulated, and

(b) the rear switch panel is properly raised and secured.

D. Install

(1) Comply with the electrical safety precautions.

(2) Secure the module to the rear switch panel with the four securing screws.

CAUTION: IT IS ESSENTIAL THAT THE ORIGINAL CABLE ROUTES ARE FOLLOWED WHEN RENEWING CABLES/FLYING LEADS. THE CABLE ROUTES ARE SEGREGATED FOR REASONS OF SAFETY, AND ARE IDENTIFIED BY THE COLOUR OF THE CABLE TIES.

(3) Identify the LIGHTS switch, equipment identification reference L1010, located near the module. Pull back the rubber boot and disconnect the existing flying lead 21 from the switch terminal, then replace the remaining cables and terminal screw.

(4) Cut and remove the cable ties on the route of the existing flying leads, between the module and switch L1010, then remove the existing flying lead 21.

(5) Route the new flying lead 21 through the rubber boot to switch L1010, and terminate it as detailed in the Wiring Diagram Manual, 20-42-01.

(6) Connect the new flying lead 21 to switch L1010, ensuring that the connection is made in accordance with the cable identification and the applicable wiring diagram. Refit the rubber boot.

(7) If the existing flying leads are already fitted with in-line crimps, i.e., a module has previously been renewed in accordance with this procedure, cut the existing flying leads (aircraft-side cables) as close as possible to the crimps.

(8) Connect the remaining new flying leads to the existing flying leads with in-line crimps as detailed in the Wiring Diagram Manual, 20-42-12, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagrams.

NOTE: Unless the flying leads have been crimped previously, crimping should be started as close as possible to the module which, for reasons of space with the panel raised, is just left of the route 4M (green) cable loom.

The crimps should be in groups of four or less, to avoid 'bunching', and should be positioned as close as possible to the panel, which requires them to be routed under and alongside the cable looms as necessary.

Cable ties can be cut off and removed, provided that a record is made of the cable routes.

(9) Fit new cable ties, where necessary, as detailed in the Wiring Diagram Manual, 20-41-09, ensuring that the correct colour code and routing is maintained.

E. Conclusion

(1) Ensure that the inside of the rear switch panel and surrounding 'ledges' are free from tools and working materials, and that the EL panel coaxial connector is passed through the appropriate panel aperture.

(2) Partially lift the rear switch panel and attach the restraining cord, then fully lift and support the

panel and fasten the quick-release fasteners.

(3) Reconnect the EL panel coaxial connector.

(4) Position the EL panel and, using the Torq-set driver, carefully secure it with the short attachment screws.

(5) Position the guard rail and, using the Torq-set driver, carefully secure it with the long attachment screws.

(6) Refit the knob to each of the three LIGHTING rotary selector switch spindles, ensuring that the spindle drive spigot is engaged with the slot in the knob, then tighten the clutch nut and fit the end cap.

(7) Make available electrical ground power as detailed in 24-41-00.

(8) On the rear switch panel, set the LIGHTS switch to the "TEST" position and check that, among others, all the captions on the warning lights module are fully illuminated.

NOTE: The STBY and T1 captions are normally illuminated, with ground power applied and the heaters inoperative.

(9) Carry out a Functional Test as detailed in 30-31-00, Adjustment/Test, but excluding the test of the pressurization static vent heaters.

END OF THIS SECTION

NEXT

FLIGHT COMPARTMENT AND VISOR WINDOW AND WINDSHIELD HEATING - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)

All the flight compartment and visor glazings are provided with electric heating elements which are used either to de-ice or demist the glazings.

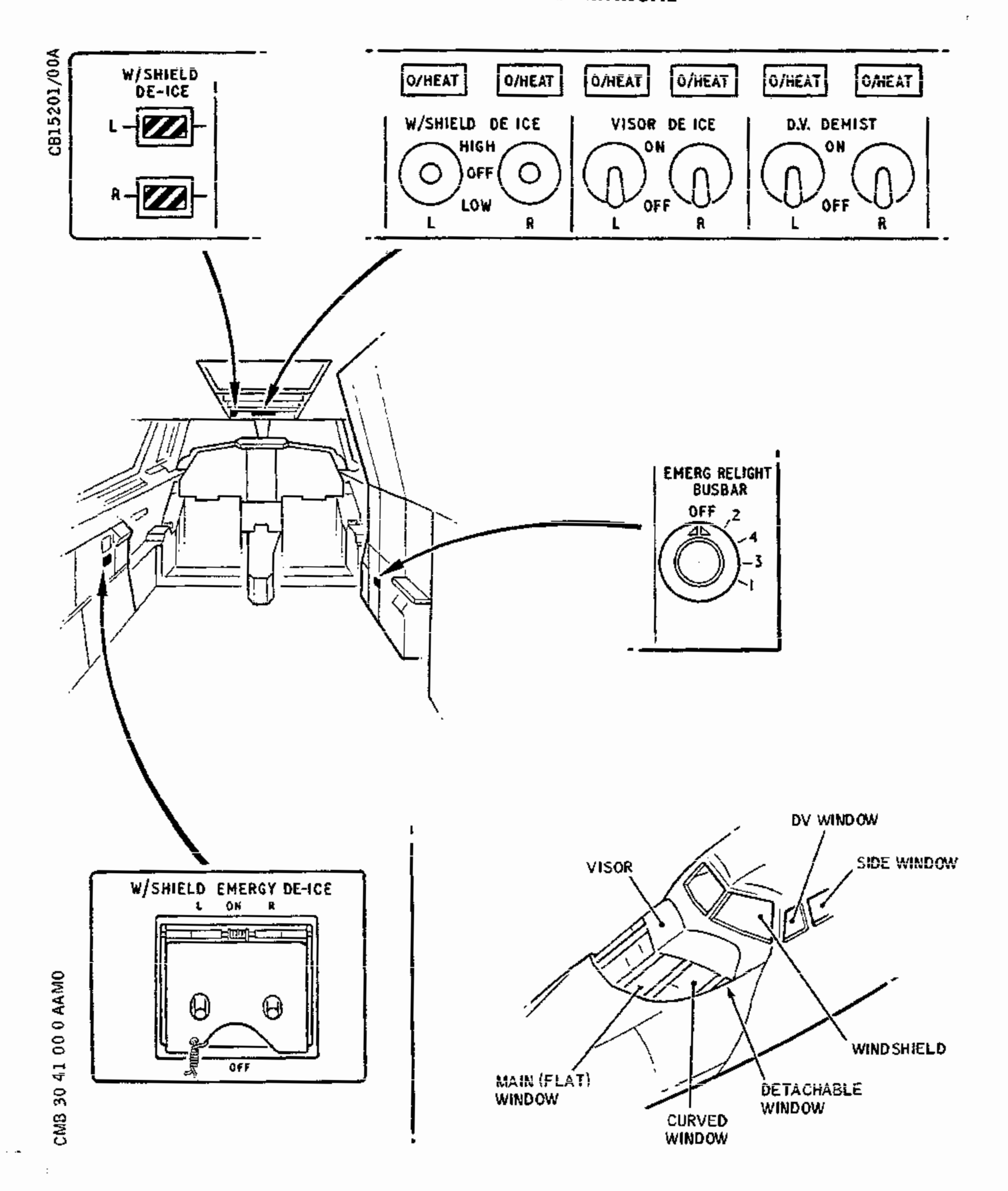
~~The flight compartment glazings, from the centre line,~~ are the windshields, which are de-iced by three separate heating elements applied in near-vertical strips, and the D.V. (direct vision) and side windows, which are each demisted by a single heating element.

The visor glazing heating elements are provided for de-icing and demisting purposes. The glazings are, also from the centre line, the main (flat) and the curved windows, each provided with three separate heating elements applied in near-horizontal strips, and the detachable windows, each provided with a single heating element.

Normally, all the heating elements in the glazings operate in conjunction with temperature control equipment to ensure that the heat applied is sufficient but not excessive. However, under certain emergency conditions that include loss of the windshield heating, power can be reapplied direct to the centre heating element of each windshield by the use of emergency de-icing switches, which are mounted on a circuit breaker panel and held in the 'off' position by a wire-locked switch guard.

Each windshield and visor window is provided with a control and protection circuit for maintaining the glazing temperature within predetermined limits and providing warning of overheat conditions. On each side of the aircraft, the D.V. window shares a common control and protection circuit with the side window. The control and protection circuits are grouped into left and right systems representing the windshields, the visor windows and the D.V. and side windows, each group having its own control switch and O/HEAT (overheat) caption on the flight compartment roof panel.

Temperature sensing for controlling the heating is carried out by sensing elements, integral with the windshields and visor windows, and by thermostats attached to the D.V. and side windows. Power for the heating is switched by normal and overheat control relays which, for the windshields and visor windows, are selected by temperature controllers reacting to the sensing elements. The control relays for the D.V. and side windows are selected directly by the thermostats.



R

Windshield and Window Heating
Figure 001

Two magnetic indicators on the flight compartment roof panel are provided for the windshield de-icing only, and serve to monitor the positions of the control relays and the availability of a control supply. With the heating operating satisfactorily, the indicators will slowly cycle in-line/cross-line with indices marked on the panel.

Each windshield can be heated at high power or low power, depending on the severity of the icing conditions. The ~~control switches on the roof panel are therefore provided~~ with two 'on' positions, marked HIGH and LOW, and the necessary adjustments to the heating power supplies are made by high/low control relays. Low power heating may be used at any time, but high power heating is automatically restricted to the aircraft being airborne with the visor in the unlocked, down position. Selection of high power heating with the aircraft on the ground and/or with the visor locked up results in low power heating being applied.

During the emergency conditions that involve load shedding, the left windshield normal heating may be either restricted to use in the low power mode, or made completely inoperative.

For reasons of priority, all the power supplies for the normal and emergency heating of the left windshield are taken from the 'A' system essential busbars. The power supplies for the heating of all the remaining glazings are taken from various main busbars. The priority thus given to the left windshield heating ensures the retention of some form of heating at all times, although the effectiveness of the heating will be reduced during emergencies when load-shedding is carried out.

The emergency windshield de-icing facility is brought into use if the normal windshield de-icing fails in flight. The facility heats only one-third of the windshield at high power, and is restricted to use with the visor in the down position and the cabin differential pressure below 2.5 psi (0.172 bar).

Static discharge units in the windshield and visor window heating suppress high voltage transients, produced by static electricity on the glazings, which would otherwise pass into the aircraft power supplies and cause malfunctions or damage equipment.

2. Heating Elements

The windshields and visor windows are of sandwich construction, and metal film heating elements are deposited on the inner surface of the outermost lamination. Where the heating

supplies are three-phase, the elements are deposited on separate areas of the glazing, one for each phase.

The D.V. and side windows have an outer glass heat shield, and metal film heating elements are deposited on its inner surface.

3. Sensing Elements

Resistance wire sensing elements with a positive temperature coefficient of resistance are embedded in the windshields and visor windows close to the heating elements. The elements are all similar but are designated 'normal' and 'overheat' to correspond with control channels in a temperature controller. An adjacent spare element is provided for each operative element.

Where heating power supplies are three-phase, a sensing element is provided for each phase, i.e., one normal and two overheat. This protects against overheating in the remaining two heating elements in the event of the loss of one phase or
R heating element.

4. Thermostats

Two normal thermostats, one operative and one spare, are
R attached to the heating element in each D.V. window. The contacts are set to break at 55 deg C, then remake at 40 deg C (nominal).

Two overheat thermostats, one operative and one spare, are
R attached to the heating element in each side window. The contacts are set to break at 85 deg C, then remake at 70 deg C (nominal).

5. Temperature Controllers

Two temperature controllers, one for the left windshield and visor window de-icing and one for the right windshield and visor window de-icing, are mounted on shelves 10-215 and 9-216 of the left and right flight compartment racking respectively.

Each controller contains thirteen control channels. Five of the channels are for normal control and eight are for overheat control. One of each type of channel is a spare.

The operative control channels are connected to normal or overheat sensing elements, as appropriate, and energize or de-energize an integral relay depending on the resistance, and therefore temperature, of the sensing element. The channels

are set to control the integral relays as follows:-

(1) Normal control: relay energized at 44 deg C, then de-energized at 38 deg C (nominal).

(2) Overheat control: relay energized at 64 deg C, then de-energized at 58 deg C (nominal).

~~Contacts of the integral relays indirectly control the heating~~ by energizing and de-energizing normal and overheat control relays. Additionally, the relays integral with the overheat control channels provide warning of overheat conditions by illuminating overheat captions.

A socket on the front panel of each controller is provided for in-situ checking of sensing elements and control supplies.

6. Normal Control Relays

Two normal control relays switch the power supplies for the windshield heating and control associated magnetic indicators, and are mounted one on panel 21-123 (LH air and ice contactor box) and one on panel 23-123 (RH air and ice contactor box) in the underfloor racking.

Eight normal control relays switch the power supplies for the visor and the D.V. and side window heating, and are mounted four on panel 13-123 (LH ice relay box) and four on panel 16-123 (RH ice relay box) in the underfloor racking.

Each relay in the windshield and visor window heating is controlled by a relay integral with a normal control channel in an associated temperature controller.

The relays in the D.V. and side window heating are controlled directly by normal thermostats attached to the D.V. windows.

7. Overheat Control Relays

Two overheat control relays switch the power supplies for the windshield heating and control associated magnetic indicators, and are mounted one on panel 21-213 and one on panel 23-123 in the underfloor racking.

Eight overheat control relays switch the power supplies for the visor and the D.V. and side window heating, and are mounted four on panel 13-123 and four on panel 16-123 in the underfloor racking.

Each relay in the windshield heating and the visor main

(flat) and curved window heating is controlled by relays integral with two overheat channels in the associated temperature controller. The relays in the visor detachable window heating are each controlled by a relay integral with one overheat control channel.

The relays in the D.V. and side window heating are controlled directly by overheat thermostats attached to the side windows.

R 8. Magnetic Indicators

R Two integrally-lit, three-position, magnetic indicators are provided to give a visual indication of the status of the normal windshield de-icing, and are mounted on a forward switch panel which forms part of flight compartment roof panel 4-211.

R Each indicator has two earth-switch controlled operating coils which share a common control supply. Without the control supply, the indicator displays diagonal stripes. Energization of one of the coils causes the indicator to display 'in-line' (a horizontal line) and energization of the other coil causes the indicator to display 'cross-line' (a vertical line).

R 9. High/Low Control Relays

Two high/low control relays select the supply voltages for the high power and low power windshield heating, and are mounted one on panel 21-123 and one on panel 23-123 in the underfloor racking.

Each relay is energized when high power heating is selected, provided the aircraft is airborne with the visor in the unlocked, down position.

The relay in the left system is either de-energized or inhibited when an auto-shed breaker opens (Ref. 24-22-00).

R 10. Static Discharge Units

Two static discharge units suppress high-voltage transients in the heating circuits of the windshield heating, and are mounted in the flight compartment, one each inside the left and right side consoles.

Two static discharge units suppress high-voltage transients in the heating circuits of the visor window heating, and are mounted in the droop nose, one each on the left and right sides.

R 11. Operation

A. Control and Indication (Ref. Fig. 001)

R The majority of the controls and all of the indicators are located on a forward switch panel, which forms part of flight compartment roof panel 4-211. The remainder of the controls, for the emergency heating of the windshields, are located behind the captain's position on circuit breaker panel 3-213.

R Associated switches on the roof panel can be used to dim or test the caption filaments (Ref. 33-14-00), and switch on and dim the magnetic indicator integral lighting filaments (Ref. 33-17-00).

Two W/SHIELD DE ICE three-position switches (HIGH - OFF - LOW), marked L and R, provide primary control over the left and right windshield de-icing. With a switch in the LOW position, the windshield heating is applied at low power. The heating will also be applied at the same low power if the switch is set to the HIGH position with the aircraft on the ground and/or with the visor in the up, locked position. However, with the aircraft airborne and the visor in the unlocked, down position, high power windshield heating will be applied when the switch is set to the HIGH position.

R Two W/SHIELD EMERGY DE-ICE two-position switches (ON - OFF), marked L and R and held in the OFF position by a wire-locked switch guard, provide primary control over the left and right windshield emergency de-icing.

Two VISOR DE ICE two-position switches (ON - OFF), marked L and R, provide primary control over the left and right visor window de-icing.

Two D.V. DEMIST two-position switches (ON - OFF), marked L and R, provide primary control over the left and right D.V. and side window demisting.

R Two W/SHIELD DE-ICE three-position magnetic indicators (diagonal stripes, cross-line and in-line), marked L and R, provide an indication of the position of the normal and overheat control relays, and the availability of a control supply, in the left and right windshield normal de-icing.

Six O/HEAT yellow captions provide warnings of overheat conditions in an associated heating circuit. Each caption slowly cycles on and off when a failure in an associated

normal control circuit introduces overheat control of the heating supply. Each caption associated with the windshield de-icing is also illuminated continuously with an associated windshield emergency de-icing switch in the 'on' position.

B. Functional Description

Apart from load shedding associated with the left windshield de-icing, the left and right systems operate in a similar manner, therefore only one system in each group is described.

(1) Windshield De-icing (Ref. Fig. 002)

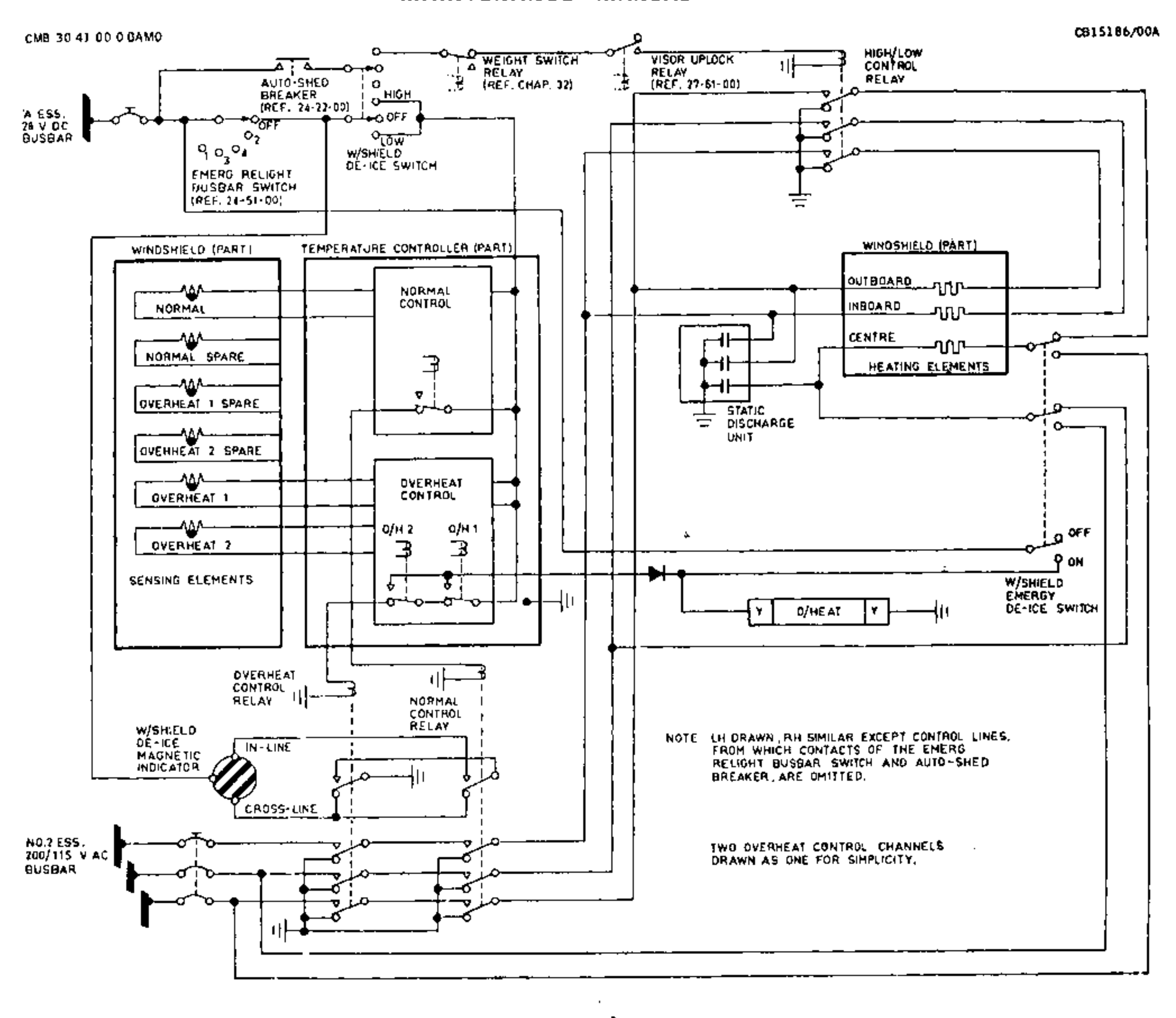
(a) Normal Windshield De-icing

The normal windshield de-icing commences when the W/SHIELD DE ICE control switch is set to a HIGH or LOW position.

At switch-on the control channels in the temperature controller sense the windshield temperature and, provided it is below 44 deg C, energize both the normal and overheat control relays to apply power to the heating elements. Subsidiary contacts on the relays apply an earth to one of two coils in the magnetic indicator. In this condition the windshield heats up with the magnetic indicator displaying in-line, until the temperature reaches 44 deg C.

At this point the normal control channel de-energizes the normal control relay to remove power from the heating elements and, at the same time, transfer the earth to the second coil of the magnetic indicator. Thus the windshield cools down with the magnetic indicator displaying cross-line until 38 deg C is reached, when the normal control channel once again energizes the normal control relay. In this way, the normal control circuit regulates the windshield temperature to between 38 and 44 deg C, with the magnetic indicator cycling in-line/cross-line as the heating power is applied and removed.

Should the normal control relay remain 'stuck on' or energized continuously due to a fault condition, the two overheat control channels, together with the overheat control relay,



R - Windshield De-icing - Simplified Schematic
Figure 002

assume control of the heating supplies and the magnetic indicator, but will instead regulate the windshield temperature to between 58 and 64 deg C. The overheat control circuit also introduces an overheat warning, illuminating the O/HEAT caption each time the overheat control relay is de-energized (at 64 deg C) and extinguishing it each time the overheat control relay is energized (at 58 deg C). Thus the caption will cycle on/off as the magnetic indicator cycles cross-line/in-line; this is known as an overheat condition.

The level of power applied during windshield heating depends on the position of the high/low control relay. With the relay de-energized the three-phase heating load is in star formation, 115 V line-to-neutral (earth), and low power heating is applied. Alternatively, with the relay energized, the configuration of the heating load is changed to delta formation, 200 V line-to-line, and high power heating is applied. The application of high power by energization of the relay is accomplished only when -

a1) the electrical system is operating under normal conditions and an associated auto-shed breaker is energized,

a2) the control switch is in the HIGH position,

a3) the aircraft is airborne, with the associated weight switch relay de-energized, and

a4) the visor is in the unlocked (down) position, with the associated visor uplock relay energized.

During certain emergency conditions involving load-shedding, the left system may be either restricted to the low power mode or made completely inoperative. The load-shedding is achieved in the first instance by the automatic de-energization of an auto-shed breaker (Ref. 24-22-00), which inhibits operation of the high/low control relay, and in the second instance by a manual selection of an EMERG RELIGHT BUSBAR switch (Ref. 24-51-00), which

removes the control supply from the system.

A direct indication is not provided for the shedding of the high power heating, although reference could be made to an ASB position magnetic indicator (Ref. 24-22-00), which would be displaying cross-line. However, for the shedding of the complete system, an indication is provided in that loss of the control supply causes the magnetic indicator to display diagonal stripes.

Static electricity building up on the windshields, and subsequently discharging to the aircraft structure, can induce high-voltage transients into the heating elements. If left unchecked, the transients could enter the power supplies and cause damage to equipment. However, static discharge units are provided to suppress the transients when power is applied to the heating elements. Additionally, a normal, or overheat, control relay will maintain the heating elements at earth potential when de-energized, in order to prevent the switching of supplies on to highly charged heating elements and to prevent flash-overs on open relay contacts.

(b) Emergency Windshield De-icing

The emergency windshield de-icing commences when the W/SHIELD EMERGY DE-ICE control switch is set to the ON position.

The facility is utilized only after a complete failure of the normal windshield de-icing. Setting the switch to the ON position transfers the centre heating element connections from the normal de-icing heating circuit, direct to a 200 V line-to-line (high power) heating supply. At the same time, the control supply is routed direct to the O/HEAT caption, and the caption is illuminated continuously as a reminder that emergency power is applied.

As the emergency heating supply is not temperature-controlled, the inadvertent operation of a switch could cause damage to a heating element, therefore a wire-locked switch guard is provided to hold both switches in the OFF position.

(2) Visor Window De-icing (Ref. Fig.003 and 004)

R Visor window de-icing commences when the VISOR DE ICE control switch is set to the ON position, provided that the visor is in the up, locked position with the associated visor uplock relay de-energized.

R Each of the visor windows is provided with a control and protection circuit. However, all operate from a single control switch, and warning of an overheat condition is displayed for all three windows by a single O/HEAT caption.

The main (flat) and curved window heating operates from three-phase supplies, and the detachable window heating operates from a single-phase supply. The supplies to the individual windows are switched by the control channels in the temperature controller in the same manner, and at the same temperatures, as the windshield heating.

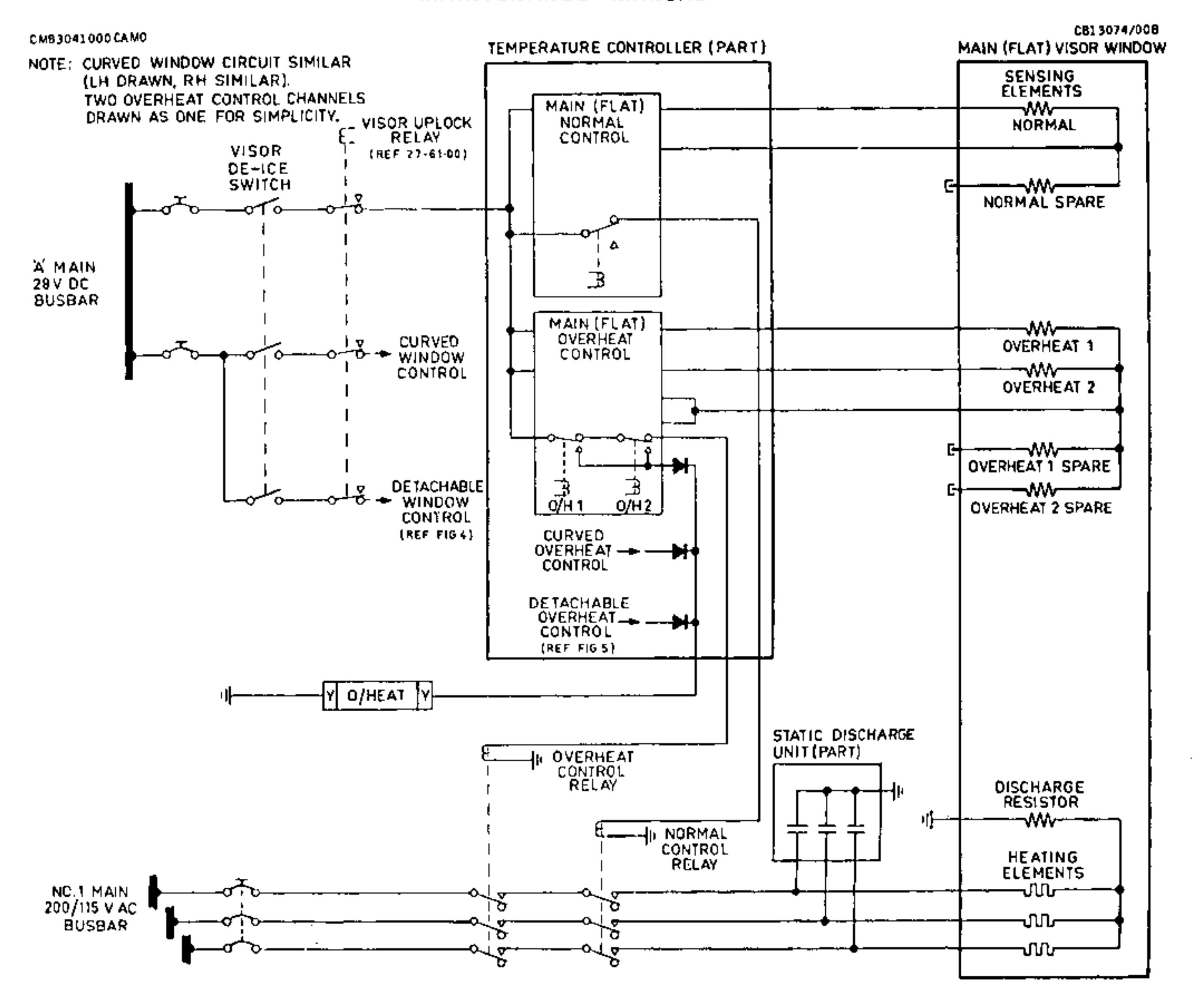
High-voltage transients, induced by static electricity, must be prevented from entering the heating power supplies as in the windshield heating. Static discharge units are again used to suppress the transients. However, with a control relay de-energized, the heating elements are maintained at earth potential by a discharge resistor in the main (flat) and curved windows and an earth return in the detachable window.

(3) D.V. and Side Window Demisting (Ref. Fig. 005)

D.V. and side window demisting commences when the
R D.V. DEMIST control switch is set to the ON position.

Only one control and protection circuit is provided for each D.V. and side window installation. Also, the demisting of each installation is controlled by a single switch, and warning of an overheat condition is displayed by one O/HEAT caption.

Provided the window temperature at switch-on is below 55 deg C, the normal thermostat in the D.V. window and the overheat thermostat in the side window engergize the respective normal and overheat control relays to apply power to the heating elements. In this condition, the windows heat up until the temperature reaches 55 deg C, when the normal thermostat de-energizes the normal control relay to remove power from the heating elements. This in

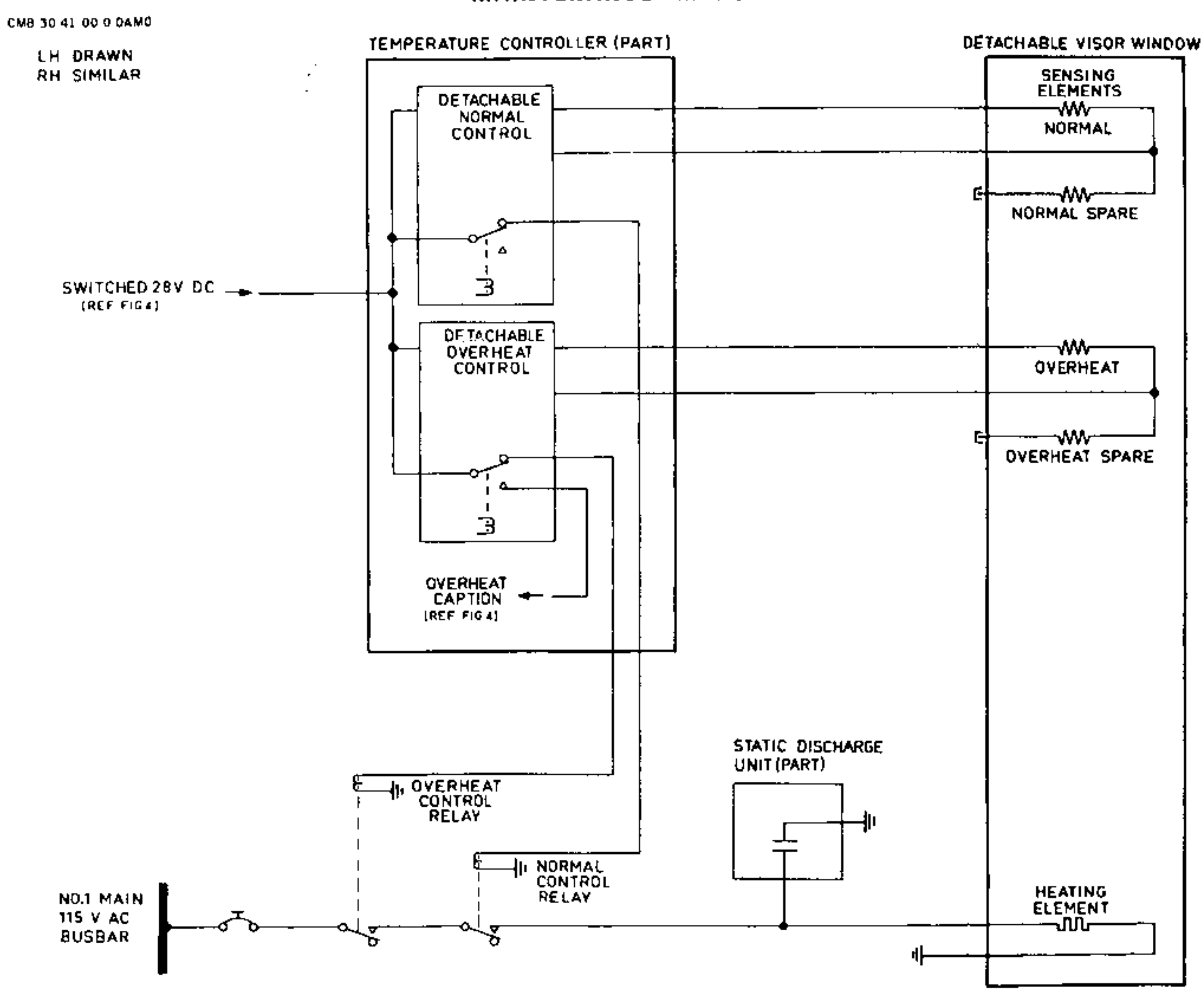


- Visor Window De-icing (Main (flat) and Curved Windows) - Simplified Schematic
Figure 003

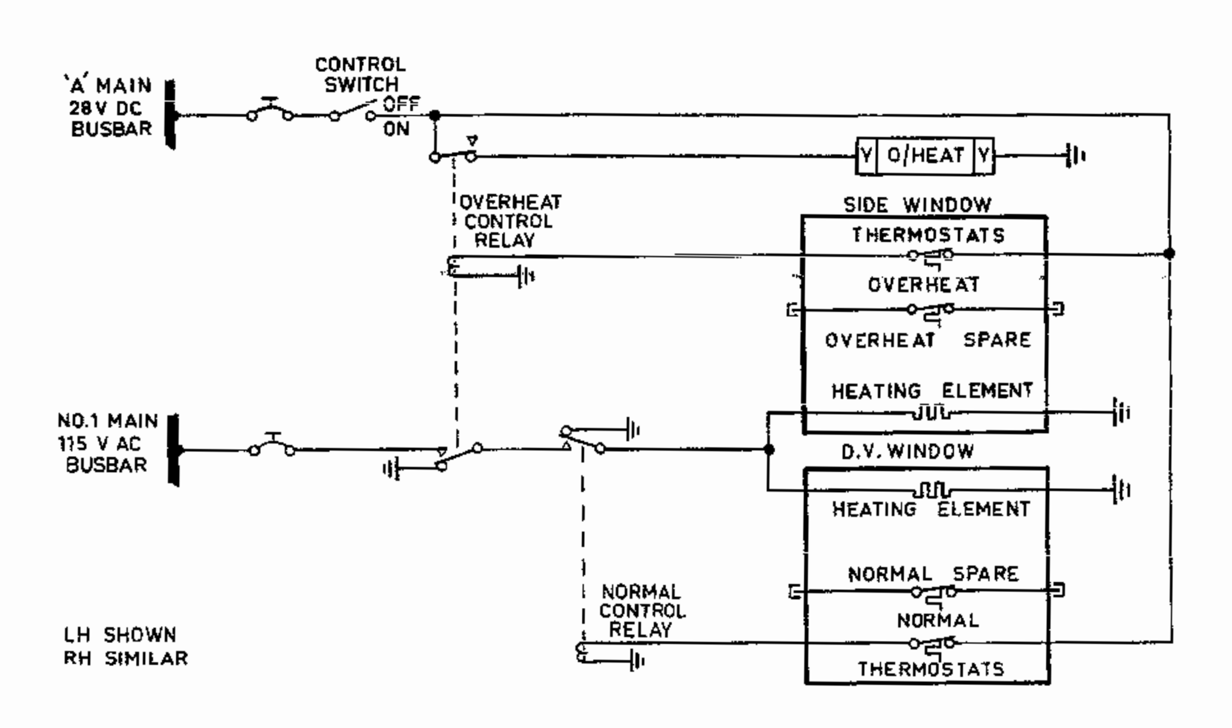
R

EFFECTIVITY: ALL

BA



- Visor Window De-icing (Detachable Window) -
Simplified Schematic
Figure 004



D.V. and Side Window Demisting -
Simplified Schematic
Figure 005

turn enables the windows to cool down to 40 deg C, when the normal thermostat re-energizes the normal control relay. Thus the normal control circuit regulates the window temperature to between 40 and 55 deg C.

Should the normal control relay remain 'stuck on' or energized continuously due to a fault condition,
R the overheat thermostat and the overheat control
R relay assume control of the heating supply, but will
R instead regulate the window temperature to between
R 70 and 85 deg C. This overheat control circuit also introduces an overheat warning, illuminating the O/HEAT caption each time the overheat control relay is de-energized (at 85 deg C) and extinguishing it each time the relay is re-energized (at 70 deg C). Thus the caption will cycle on and off in the overheat condition.

As in the windshield and visor window heating, static electricity induces transients into the heating

elements, therefore the elements are maintained at earth potential when a normal, or overheat, control relay is de-energized.

C. Electrical Power Supplies

Electrical power is supplied from the busbars listed in Table 1.

SERVICE	BUSBAR	CIRCUIT BREAKER PANEL
Windshield de-icing control, LH	'A' essential 28 V d.c.	1-213
Windshield de-icing supply, LH	No.2 essential 200/115 V a.c.	2-213
Windshield de-icing control, RH	'B' main 28 V d.c.	15-216
Windshield de-icing supply, RH	No.4 main 200/115 V a.c.	14-216
Visor window de-icing control, LH	'A' main 28 V d.c.	15-215
Visor window de-icing supply, LH	No.1 main 200/115 V a.c.	14-215
Visor window de-icing control, RH	'B' main 28 V d.c.	15-216
Visor window de-icing supply, RH	No.3 main 200/115 V a.c.	13-216
D.V. and side window demisting control, LH	'A' main 28 V d.c.	15-215
D.V. and side window demisting supply, LH	No.1 main 115 V a.c.	14-215
D.V. and side window demisting control, RH	'B' main 28 V d.c.	15-216
D.V. and side window demisting supply, RH	No.3 main 115 V a.c.	13-216

Electrical Power Supplies

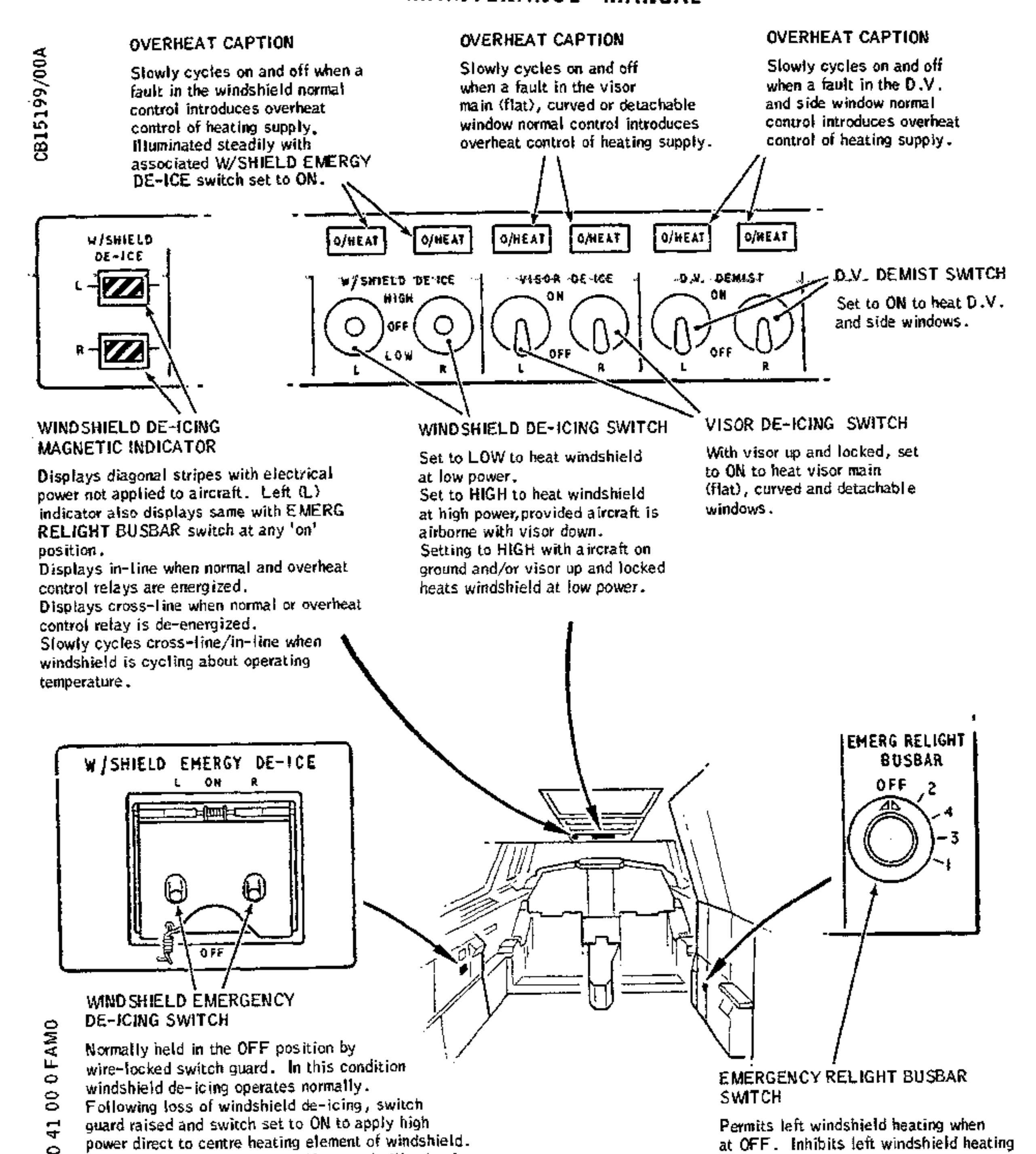
SERVICE	BUSBAR	CIRCUIT BREAKER PANEL

Table 1

R 12. System Management (Ref. Fig. 006)

All the flight compartment and visor windows can be heated to prevent ice and/or mist forming on the glazings. The
R operating switches and associated captions and indicators
R are located on the flight compartment roof panel and circuit
R breaker panel 3-213. A switch on the left leg of the third crew member's station effects, among other functions, the shedding of certain windshield heating loads.

Electrical ground power has to be applied for all heating, and hydraulic ground power may be required for operating the visor during the windshield or visor window heating.



R

System Management
Figure 006

FLIGHT COMPARTMENT AND VISOR WINDOW AND WINDSHIELD HEATING - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

BECAUSE OF THE POSSIBILITY OF SHATTERING, D.V. (DIRECT VISION) AND SIDE WINDOWS MUST NOT BE COOLED IN ANY WAY.

ALL PERSONNEL MUST REMAIN CLEAR WHEN VISOR IS OPERATED.

DO NOT LEAVE HEATED GLAZINGS UNATTENDED.

CAUTION: THROUGHOUT THE TESTS D.V. AND SIDE WINDOW TEMPERATURES MUST NOT EXCEED 90 deg C, AND WINDSHIELD AND VISOR GLAZING TEMPERATURES MUST NOT EXCEED 75 deg C. IN HIGH AMBIENT TEMPERATURES THE WINDSHIELDS AND/OR VISOR
R WINDOWS ONLY MAY BE COOLED BY SPRAYING WITH COLD WATER EVENLY DISTRIBUTED.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. paras.3. to 8.), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

Where circuits are similar for LH and RH systems, a single

trouble shooting procedure is provided, and the references to the associated components listed in Table 101 are given, e.g., 'Renew Relay (7) or (8)'. These references, and others applicable to associated components, are presented in the sequence LH, RH.

Trouble shooting for the windshield de-icing and visor window de-icing is sub-divided into two parts and three parts respectively, to expedite the identification of faults. The first part associated with the windshield de-icing concerns the control, heating and indication in the low power configuration, and the second part concerns only the selection
R of the high power and low power heating supplies. Separate
R trouble shooting procedures are not provided for the windshield
R emergency override as it involves only one component, the
R W/SHIELD EMERGY DE-ICE switch, in each sub-system. Each part of the trouble shooting associated with the visor window de-icing concerns the control, heating and indication for a particular visor window.

Paragraphs 3. to 8. (the trouble shooting procedures) may be carried out individually or collectively, but in each instance must be preceded by the associated preparation procedure. When carrying out the paragraphs collectively, it may be necessary to disregard some operations of the preparation procedures to avoid duplication.

The windshields and windows are provided with spare sensing elements/thermostats and may be temporarily rewired.

2. Preparation

WARNING: IN THE TROUBLE SHOOTING PROCEDURES, BACK-UP OVERHEAT CIRCUITS ARE BYPASSED AND THE WINDSHIELDS/WINDOWS ATTAIN THEIR MAXIMUM OVERHEAT TEMPERATURES. ENSURE THAT -

(1) NO ONE TOUCHES THE WINDSHIELDS/WINDOWS UNLESS SPECIFICALLY INSTRUCTED TO DO SO, AND

(2) THE APPROPRIATE SYSTEM SWITCH IS RETURNED TO THE "OFF" POSITION IF THE WINDSHIELD/WINDOW EXCEEDS THE OVERHEAT CUT-OFF TEMPERATURE.

CAUTION: ENSURE THAT THE VISOR AND FLIGHT COMPARTMENT WINDOWS ARE FREE FROM PROTECTIVE COVERS, ETC.

NOTE: In the trouble shooting, the operation of each normal and overheat channel is checked independently.

Adequate time must be allowed during these procedures for the heating (approximately 30 min for demisting and 8 min for de-icing) and cooling of the glazings, and it should be borne in mind that each test can be initiated only with the glazing, and hence the associated thermostat or sensor, at a temperature below the control switching point.

A. Equipment and Materials

DESCRIPTION	PART NO.
Two multimeters, e.g., Avometer type 8	-
R Thermometer with remote non-metallic probe, e.g., Comark Electronics type 3001 and probe type KASP	-
Throttle control system test set	QT6 A16-24
R Resistance meter	Croydon Precision Instruments Type PW2 or equivalent
Two resistances, each approximately 470 ohm, e.g., decade resistance boxes	-
Circuit breaker safety clips	-

B. D.V. and Side Window Demisting

(1) Ensure that the associated circuit breakers are set (Ref. Table 101).

(2) Ensure that the two D.V. DEMIST switches are set to OFF.

(3) Make available electrical ground power as detailed in 24-41-00.

C. Windshield De-icing (Low Power Operation)

(1) Ensure that the associated circuit breakers are set (Ref. Table 101).

(2) Gain access to the left (right) temperature controller by removing the panel covering shelf 10-215 (9-216) of the flight compartment racking.

R (3) Ensure that -

R (a) both W/SHIELD DE-ICE magnetic indicators display
R diagonal stripes, signifying 'power off',

R (b) the two W/SHIELD DE ICE switches on panel 4-211
R are set to the OFF position, and

R (c) the EMERG RELIGHT BUSBAR switch on panel 18-214
R is set to the OFF position.

(4) Make available electrical ground power as detailed in 24-41-00.

(5) Check that the visor is in the fully down position. If not -

(a) make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29, then,

(b) observing all relevant safety precautions, unlock and lower the visor (Ref. 27-61-00).

(6) Place a warning notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

D. Windshield De-icing (High/Low Selection)

(1) Ensure that the associated circuit breakers are set (Ref. Table 101).

(2) Gain access to the left (right) temperature controller by removing the panel covering shelf 10-215 (9-216) of the flight compartment racking.

NOTE: If resistances were previously connected to the controller test socket, they should now be removed.

(3) If the left system is to be tested, gain access to the No.1 engine control amplifier (throttle amplifier) by removing the panel covering shelf 8-215 of the flight compartment racking.

(4) Ensure that all services liable to be adversely affected by the tripping of the weight switch circuit

breakers are effectively isolated (Ref. 7-11-00), except for the windshield de-icing systems.

(5) Trip and fit a safety clip to the LH UC WEIGHT SW A SYS SUP circuit breaker G292, panel 1-213, map ref.M17 (RH UC WEIGHT SW B SYS SUP, G294, 3-213, B9).

R (6) Ensure that -

R (a) both W/SHIELD DE-ICE magnetic indicators display
R diagonal stripes, signifying 'power off',

R (b) the two W/SHIELD DE ICE switches on panel 4-211
R are set to the OFF position, and

R (c) the EMERG RELIGHT BUSBAR switch on panel 18-214
R is set to the OFF position.

(7) Make available electrical ground power as detailed in 24-41-00.

(8) Ensure that the visor is in the fully down position. If not -

(a) make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29, then,

(b) observing all relevant safety precautions, unlock and lower the visor (Ref. 27-61-00).

(9) Place a warning notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

NOTE: Operations (10) to (14) inclusive apply to the left system only, and are required to close the auto-shed breaker (Ref. 24-22-00). Specific settings of the engine throttles and test set switches are not required.

(10) Depressurize the green hydraulic system and disconnect hydraulic ground power as detailed in Chapter 29.

(11) On flight compartment roof panel 4-211, check that the Nos.1 and 2 HP VALVE switches are set to SHUT and that the Nos.1 and 2 AUTO IGNITION and THROTTLE MASTER switches are set to OFF.

(12) Trip and fit a safety clip to the ENG 1 MAIN THROT SUP circuit breaker 1K1, panel 2-213, map ref.F12.

(13) Connect cable 2 of the throttle control system test set between connector PL2 of the test set and connector SKT 2 of the No.1 engine control amplifier, equipment identification reference 1K20.

WARNING: THE ENGINES MUST NOT BE RUN OR THE GREEN HYDRAULIC SYSTEM PRESSURIZED WHILE THE THROTTLE CONTROL SYSTEM TEST SET IS CONNECTED TO THE AIRCRAFT SYSTEM.

(14) Reset the ENG 1 MAIN THROT SUP circuit breaker 1K1, panel 2-213, map ref.F12, and ensure that -

(a) the No.1 engine N2 rpm indicator on the pilots' dashboard centre instrument panel reads approximately 65 per cent, and

(b) the magnetic indicator immediately below the emergency generator FAIL caption, on the lower part of electrical generating control panel 6-214 (the ASB position magnetic indicator, but not marked as such), displays in-line.

E. Main (Flat) Visor Window De-icing

(1) Ensure that the associated circuit breakers are set (Ref. Table 101), except for the following (LH or RH, as appropriate), which should be tripped and fitted with safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH CURVED VISOR HTR SUP	14-215	1H223	G8
LH BOTTOM VISOR HTR SUP	14-215	1H225	E9
RH CURVED VISOR HTR SUP	13-216	2H223	G10
RH BOTTOM VISOR HTR SUP	13-216	2H225	B10

(2) Gain access to the left (right) temperature controller by removing the panel covering shelf 10-215 (9-216) of the flight compartment racking.
R Ensure that no shorting plug is fitted to test socket
R 1H149-B(2H149-B).

(3) Make available electrical ground power as detailed in 24-41-00.

(4) Ensure that the two VISOR DE ICE switches are set to OFF.

(5) Ensure that the visor is in the up, locked position. If not -

(a) make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29, then,

(b) observing all relevant safety precautions, raise the visor to the up, locked position (Ref. 27-61-00).

(6) Place a warning notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

F. Curved Visor Window De-icing

(1) Ensure that the associated circuit breakers are set (Ref. Table 101), except for the following (LH or RH, as appropriate), which should be tripped and fitted with safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH FLAT VISOR HTR SUP	14-215	1H221	G5
LH BOTTOM VISOR HTR SUP	14-215	1H225	E9
RH FLAT VISOR HTR SUP	13-216	2H221	G13
RH BOTTOM VISOR HTR SUP	13-216	2H225	B10

(2) Gain access to the left (right) temperature

controller by removing the panel covering shelf 10-215 (9-216) of the flight compartment racking.
R Ensure that no shorting plug is fitted to test socket
R 1H149-B(2H149-B).

(3) Make available electrical ground power as detailed in 24-41-00.

(4) Ensure that the two VISOR DE ICE switches are set to OFF.

(5) Ensure that the visor is in the up, locked position. If not -

(a) make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29, then,

(b) observing all relevant safety precautions, raise the visor to the up, locked position (Ref. 27-61-00).

(6) Place a warning notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

G. Detachable Visor Window De-icing

(1) Ensure that the associated circuit breakers are set (Ref. Table 101), except for the following (LH or RH, as appropriate), which must be tripped and fitted with safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH FLAT VISOR HTR SUP	14-215	1H221	G5
LH CURVED VISOR HTR SUP	14-215	1H223	G8
RH FLAT VISOR HTR SUP	13-216	2H221	G13
RH CURVED VISOR HTR SUP	13-216	2H223	G10

(2) Gain access to the left (right) temperature controller by removing the panel covering shelf

10-215 (9-216) of the flight compartment racking.
R Ensure that no shorting plug is fitted to test socket
R 1H149-B(2H149-B).

(3) Make available electrical ground power as detailed in 24-41-00.

(4) Ensure that the two VISOR DE ICE switches are set to OFF.

(5) Ensure that the visor is in the up, locked position. If not -

(a) make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29, then,

(b) observing all relevant safety precautions, raise the visor to the up, locked position (Ref. 27-61-00).

(6) Place a warning notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

3. Trouble Shooting - D.V. and Side Window Demisting

```
A.*******************************************
  *Prepare to trouble shoot (Ref. para.2.).  *
  *Identify test socket UT1801, panel 13-123 *
  *(UT1802, 16-123), then set the left       *
  *(right) D.V. DEMIST switch to the "ON"    *
  *position.  Check by hand or temperature   *
  *probe that the appropriate windows are    *
  *heating up, then check that 28 V d.c. is  *
  *available at the test socket, pin 1C.     *
  *Monitor the 28 V and check that it cycles *
  *off/on when the heating is cycling about  *
  *the normal operating temperature.  IF -   *
  *******************************************
            |    |
            |    |         -----------------------------------
            |    |        |1. D.V. and side windows not heat- |
           OK   NOT OK----|   ing up, and 28 V not available |
            |             |   at test socket pin 1C - Chart   |
            |             |   101.                            |
            |             |2. D.V. and side windows not heat- |
            |             |   ing up, and 28 V at test socket |
            |             |   pin 1C not cycling off/on -     |
            |             |   Chart 102.                      |
            |             |3. Side window not heating up -    |
            |             |   renew Side Window (15) or (16). |
            |             |4. 28 V at test socket pin 1C not  |
            |             |   cycling off/on, but O/HEAT      |
            |             |   caption cycling on/off after    |
            |             |   approximately 30 min - Chart    |
            |             |   103.                            |
            |             |5. 28 V not available at test      |
            |             |   socket pin 1C, but O/HEAT       |
            |             |   caption cycling on/off after    |
            |             |   approximately 30 min - renew    |
            |             |   Relay (7) or (8).               |
            |              -----------------------------------
            |
```

```
                |
B.*******************************************
  *Return the D.V. DEMIST switch to the "OFF"*
  *position, connect a link between test     *
  *socket pins 1A and 1C, then set the D.V.  *
  *DEMIST switch to the "ON" position.  Check*
  *that 28 V d.c. is available at test socket*
  *pin 1C and cycles off/on when the heating *
  *is cycling about the overheat operating   *
  *temperature (O/HEAT caption will cycle    *
  *on/off as the 28 V cycles off/on).  IF -  *
  *******************************************
                      |
                      |     -----------------------------------
                      |     |D.V. and side windows exceed      |
                   NOT OK------|maximum overheat temperature, but |
                            |O/HEAT caption not illuminated -  |
                            |Chart 104.                        |
                            -----------------------------------
```

4. Trouble Shooting - Windshield De-icing (Low Power Operation)

```
A.*******************************************
  *Prepare to trouble shoot (Ref. para.2.).  *
  *Set the left (right) W/SHIELD DE ICE      *
  *switch to the "LOW" position and check    *
  *that the left (right) W/SHIELD DE-ICE     *
  *magnetic indicator displays in-line.      *
  *Check also, by hand or temperature probe, *
  *that all three heated areas of the appro- *
  *priate windshield are heating up. Monitor *
  *the magnetic indicator and the associated *
  *O/HEAT caption and check that, as the     *
  *heating cycles about the normal operating *
  *temperature, the magnetic indicator       *
  *cycles cross-line/in-line and the caption *
  *remains extinguished.  IF -               *
  *******************************************
                 |    |
                 |    |     -----------------------------------
                 |    |     |1. One-third or two-thirds of     |
                 OK   NOT OK------|   windshield not heating up (also,|
                 |          |   O/HEAT caption may cycle on/off |
                 |          |   after approximately 8 min) -   |
                 |          |   Chart 105.                     |
                 |          |2. Left windshield not heating up -|
                 |          |   Chart 106.                     |
```

3. Right windshield not heating up - Chart 107.
4. Windshield not heating up, magnetic indicator displaying cross-line and caption illuminated continuously - transpose Controllers (69) and (70). Has fault cleared? If YES, renew faulty Controller (69) or (70). If NO, carry out a resistance check of the windshield sensing elements (Ref. Adjustment/Test); transfer the wiring to the spare sensing element (Ref. Approved Repairs), or renew Windshield (33) or (34) as necessary.
5. O/HEAT caption cycling on/off after approximately 8 min - rectify as in 4., above.
6. Magnetic indicator cycling diagonal stripes/in-line, or diagonal stripes/cross-line - renew Magnetic Indicator (29) or (30).
7. Magnetic indicator displays diagonal stripes with windshield de-icing switched on - Chart 108.

B. Return the W/SHIELD DE-ICE switch to the "OFF" position, then identify the test socket on the front of Controller (69) or (70), and connect one 470 ohm resistance between controller test socket pins B and C and the other between pins q and r. Set the W/SHIELD DE ICE switch to the "LOW" position and check that the magnetic indicator displays in-line. Monitor the magnetic indicator and the associated O/HEAT caption and check that, as the heating cycles about the overheat operating temperature, the magnetic indicator cycles cross-line/in-line, with the caption cycling on/off at the same time.

OK   NOT OK

1. Windshield exceeds maximum overheat temperature, with magnetic indicator continuously displaying in-line and caption not illuminated - transpose Controllers (69) and (70). Has fault cleared? If YES, renew faulty Controller (69) or (70). If NO, carry out a resistance check of the windshield sensing elements (Ref. Adjustment/Test);
R transfer the wiring to the spare sensing element (Ref. Approved
R Repairs), or renew Windshield (33) or (34) as necessary.
2. Windshield exceeds maximum overheat temperature, with magnetic indicator continuously displaying in-line and caption illuminated continuously - renew Relay (25) or (26).

C. Return the W/SHIELD DE ICE switch to the "OFF" position, then remove the 470 ohm resistance from test socket pins q and r and connect it between pins W and X. Set the W/SHIELD DE ICE switch to the "LOW" position and check that the magnetic indicator displays in-line. Monitor the magnetic indicator and the associated O/HEAT caption and check that, as the heating cycles about the overheat operating temperature, the magnetic indicator cycles cross-line/in-line, with the caption cycling on/off at the same time.

```
                 |
                 |
                 |       -----------------------------------
                 |      |Windshield exceeds maximum overheat|
                 NOT OK------|temperature, with magnetic         |
                        |indicator continuously displaying  |
                        |in-line and caption not illuminated|
                        |- transpose Controllers (69) and   |
                        |(70).  Has fault cleared? If YES,  |
                        |renew faulty Controller (69) or    |
                        |(70).  If NO, carry out a resis-   |
                        |ance check of the windshield       |
                        |sensing elements (Ref. Adjustment/ |
                        |Test); transfer the wiring to the  |
                        |spare sensing element (Ref.        |
R                       |Approved Repairs), or renew Wind-  |
R                       |shield (33) or (34) as necessary.  |
                         -----------------------------------
```

5. Trouble Shooting - Windshield De-icing (High/Low Selection)

```
A.********************************************
  *Prepare to trouble shoot (Ref. para.2.).  *
  *Set the left (right) W/SHIELD DE ICE      *
  *switch to the "LOW" position and check    *
  *that, when the heating is cycled 'on', low*
  *power is applied to the heating elements, *
  *i.e., when the left (right) W/SHIELD      *
  *DE-ICE magnetic indicator displays in-    *
  *line, 115 V a.c. is available between     *
  *terminal A2 of Relay (23) or (24) and     *
  *terminal C2 of Relay (27) or (28).  IF -  *
  ********************************************
              |    |
              |    |     -----------------------------------
              |    |    |High power (200 V a.c.) applied to |
             OK   NOT OK------|windshield heating elements with   |
              |         |low power selected - check for 28 V|
              |         |d.c. at terminal X1 of Relay (27)  |
              |         |or (28).  If YES, renew Switch (21)|
              |         |or (22).  If NO, renew Relay (27)  |
              |         |or (28).                           |
              |          -----------------------------------
              |
```

```
                 |
B.*********************************************
  *Set the left (right) W/SHIELD DE ICE        *
  *switch to the "HIGH" position and check     *
  *that the magnetic indicator once again      *
  *displays in-line.  Check also that, when    *
  *the heating is cycled 'on', high power is   *
  *applied to the heating elements, i.e.,      *
  *when the magnetic indicator displays in-    *
  *line, 200 V a.c. is available between       *
  *terminal A2 of Relay (23) or (24) and       *
  *terminal C2 of Relay (27) or (28).  IF -    *
  *********************************************
                      |
                      |        ------------------------------------
                      |       |1. Magnetic indicator not cycling   |
                   NOT OK-----|   in-line with high power selected |
                              |   - renew Switch (21) or (22).     |
                              |2. Low power (115 V a.c.) applied   |
                              |   to windshield heating elements   |
                              |   with high power selected -       |
                              |   Chart 109.                       |
                               ------------------------------------
```

6. Trouble Shooting - Main (Flat) Visor Window De-icing

```
A.*********************************************
  *Prepare to trouble shoot (Ref. para.2.).    *
  *Identify the test socket on the front of    *
  *Controller (69) or (70), then set the left  *
  *(right) VISOR DE ICE switch to the "ON"      *
  *position.  Check by hand or temperature     *
  *probe that all three heated areas of the    *
  *appropriate visor window are heating up,    *
  *then check that 28 V d.c. is available at   *
  *the test socket, pin j.  Monitor the 28 V   *
  *at pin j and check that it cycles off/on    *
  *when the heating is cycling about the       *
  *normal operating temperature.  IF -         *
  *********************************************
                |     |
                |     |
```

```
          |      |
          |      |        -------------------------------------
          |      |       |1. One-third or two-thirds of main   |
          OK     NOT OK------|   (flat) visor window not heating   |
          |              |   up (also, O/HEAT caption may      |
          |              |   cycle on/off after approximately|
          |              |   8 min) - Chart 110.               |
          |              |2. Main (flat) visor window not      |
          |              |   heating up - Chart 111.           |
          |              |3. Main (flat) visor window not      |
          |              |   heating up and O/HEAT caption     |
          |              |   illuminated continuously -        |
          |              |   transpose Controllers (69) and    |
          |              |   (70).  Has fault cleared?  If     |
          |              |   YES, renew Controller (69) or     |
          |              |   (70).  If NO, carry out a         |
          |              |   resistance check on the window    |
          |              |   sensing elements (Ref.            |
          |              |   Adjustment/Test);  transfer the   |
          |              |   wiring to the spare sensing       |
R         |              |   element (Ref. Approved Repairs),|
          |              |   or renew Window (63) or (64) as   |
          |              |   necessary.                        |
          |              |4. 28 V at test socket pin j not     |
          |              |   cycling off/on (also, O/HEAT      |
          |              |   caption cycling on/off after      |
          |              |   approximately 8 min) - rectify    |
          |              |   as in 3., above.                  |
          |               -------------------------------------
          |
B.********************************************
  *Return the VISOR DE ICE switch to the     *
  *"OFF" position, then connect one 470 ohm  *
  *resistance between controller test socket *
  *pins c and t, and another between pins b  *
  *and G.  Set the VISOR DE ICE switch to the*
  *"ON" position and check that 28 V d.c. is *
  *available at the test socket, pin n, and  *
  *that it cycles off/on when the heating is *
  *cycling about the overheat operating      *
  *temperature (the O/HEAT caption will      *
  *cycle on/off as the 28 V cycles off/on).  *
  *IF -                                      *
  ********************************************
          |      |
```

OK — NOT OK:

1. Main (flat) visor window exceeds maximum overheat temperature, but 28 V at pin n not cycling off/on (also, O/HEAT caption not illuminated) - transpose Controllers (69) and (70). Has fault cleared? If YES, renew faulty Controller (69) or (70). If NO, carry out a resistance check of the window sensing elements (Ref. Adjustment/Test); transfer the wiring to the spare sensing element (Ref. Approved Repairs), or renew Window (63) or (64) as necessary.
2. Main (flat) visor window exceeds maximum overheat temperature, but 28 V at pin n not cycling off/on (also, O/HEAT caption illuminated continuously) - renew Relay (55) or (56).

C. Return the VISOR DE ICE switch to the "OFF" position, then remove the 470 ohm
R resistance from test socket pin G and connect it to pin F. Set the VISOR DE ICE switch to the "ON" position and check that 28 V d.c. is available at the test socket, pin n, and that it cycles off/on when the heating is cycling about the overheat operating temperature (the O/HEAT caption will cycle on/off as the 28 V cycles off/on). IF -

```
                              |
                              |          --------------------------------------
                              |         |Main (flat) visor window exceeds     |
                        NOT OK------    |maximum overheat temperature, but    |
                                        |28 V at pin n not cycling off/on     |
                                        |(also, O/HEAT caption not illumin-   |
                                        |ated) - transpose Controllers (69)   |
                                        |and (70).  Has fault cleared? If     |
                                        |YES, renew faulty Controller (69)    |
                                        |or (70).  If NO, carry out a resis-  |
                                        |tance check of the window sensing    |
                                        |elements (Ref. Adjustment/Test);     |
                                        |transfer the wiring to the spare     |
R                                       |sensing element (Ref. Approved       |
R                                       |Repairs), or renew Window (63) or    |
                                        |(64) as necessary.                   |
                                         --------------------------------------
```

7. <u>Trouble Shooting - Curved Visor Window De-icing</u>

```
A.********************************************
  *Prepare to trouble shoot (Ref. para.2.).  *
  *Identify the test socket on the front of  *
  *Controller (69) or (70), then set the left*
  *(right) VISOR DE ICE switch to the "ON"   *
  *position.  Check by hand or temperature   *
  *probe that all three heated areas of the  *
  *appropriate visor window are heating up,  *
  *then check that 28 V d.c. is available at *
  *the test socket, pin P.  Monitor the 28 V *
  *at pin P and check that it cycles off/on  *
  *when the heating is cycling about the     *
  *normal operating temperature.  IF -       *
  *******************************************
            |    |
            |    |           --------------------------------------
            |    |          |1. One-third or two-thirds of        |
            OK   NOT OK-----|   curved visor window not heating   |
            |               |   up (also, O/HEAT caption may      |
            |               |   cycle on/off after approximately  |
            |               |   8 min) - Chart 112.               |
            |               |2. Curved visor window not heating   |
            |               |   up - Chart 113.                   |
            |               |3. Curved visor window not heating   |
            |               |   up and O/HEAT caption illumin-    |
            |               |   ated continuously - transpose     |
```


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Controllers (69) and (70). Has fault cleared? If YES, renew Controller (69) or (70). If NO, carry out a resistance check on the window sensing elements (Ref. Adjustment/Test); transfer the wiring to the spare sensing
R element (Ref. Approved Repairs), or renew Window (65) or (66) as necessary.

4. 28 V at test socket pin P not cycling off/on (also, O/HEAT caption cycling on/off after approximately 8 min) - rectify as in 3., above.

B. Return the VISOR DE ICE switch to the "OFF" position, then connect one 470 ohm resistance between controller test socket pins a and Z, and another between pins D and E. Set the VISOR DE ICE switch to the "ON" position and check that 28 V d.c. is available at the test socket, pin T, and that it cycles off/on when the heating is cycling about the overheat operating temperature (the O/HEAT caption will cycle on/off as the 28 V cycles off/on). IF -

OK

NOT OK

1. Curved visor window exceeds maximum overheat temperature, but 28 V at pin T not cycling off/on (also, O/HEAT caption not illuminated) - transpose Controllers (69) and (70). Has fault cleared? If YES, renew faulty Controller (69) or (70). If NO, carry out a resistance check of the window sensing elements (Ref. Adjustment/Test); transfer the wiring to the spare
R sensing element (Ref. Approved
R Repairs), or renew Window (65) or (66) as necessary.

2. Curved visor window exceeds maximum overheat temperature, but 28 V at pin T not cycling off/on (also, O/HEAT caption illuminated continuously) - renew Relay (57) or (58).

C. Return the VISOR DE ICE switch to the "OFF" position, then remove the 470 ohm resistance from test socket pin E and connect it to pin Y. Set the VISOR DE ICE switch to the "ON" position and check that 28 V d.c. is available at the test socket, pin T, and that it cycles off/on when the heating is cycling about the overheat operating temperature (the O/HEAT caption will cycle on/off as the 28 V cycles off/on). IF -

NOT OK------ Curved visor window exceeds maximum overheat temperature, but 28 V at pin T not cycling off/on (also, O/HEAT caption not illuminated) - transpose Controllers (69) and (70) Has fault cleared? If YES, renew faulty Controller (69) or (70). If NO, carry out a resistance check of the window sensing elements (Ref. Adjustment/Test); transfer the wiring to the spare sensing element (Ref. Approved Repairs) or renew Window (65) or (66) as necessary.

R

8. Trouble Shooting - Detachable Visor Window De-icing

```
A.******************************************
  *Prepare to trouble shoot (Ref. para.2.).  *
  *Identify the test socket on the front of  *
  *Controller (69) or (70), then set the left*
  *(right) VISOR DE ICE switch to the "ON"   *
  *position.  Check by hand or temperature   *
  *probe that the appropriate visor window   *
  *is heating up, then check that 28 V d.c.  *
  *is available at the test socket, pin R.   *
  *Monitor the 28 V at pin R and check that  *
  *it cycles off/on when the heating is      *
  *cycling about the normal operating        *
  *temperature.  IF -                        *
  ******************************************
              |    |
              |    |
              |    |            ---------------------------------
              |    |           |1. Detachable visor window not    |
              OK   NOT OK------|   heating up - Chart 114.        |
              |                |2. Detachable visor window not    |
              |                |   heating up and O/HEAT caption  |
              |                |   illuminated continuously -     |
              |                |   transpose Controllers (69) and |
              |                |   (70).  Has fault cleared?  If  |
              |                |   YES, renew faulty Controller   |
              |                |   (69) or (70).  If NO, carry out|
              |                |   a resistance check on the window|
              |                |   sensing elements (Ref.         |
              |                |   Adjustment/Test); transfer the |
              |                |   wiring to the spare sensing    |
R             |                |   element (Ref. Approved Repairs)|
              |                |   or renew Window (67) or (68) as|
              |                |   necessary.                     |
              |                |3. 28 V at test socket pin R not  |
              |                |   cycling off/on (also, O/HEAT   |
              |                |   caption cycling on/off after   |
              |                |   approximately 8 min) - rectify |
              |                |   as in 2., above.               |
              |                 ---------------------------------
              |
```


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B. *Return the VISOR DE ICE switch to the "OFF" position, then connect a 470 ohm resistance between controller test socket pins BB and GG. Set the VISOR DE ICE switch to the "ON" position and check that 28 V d.c. is available at the test socket, pin U, and that it cycles off/on when the heating is cycling about the overheat operating temperature (the O/HEAT caption will cycle on/off as the 28 V cycles off/on). IF -*

NOT OK ------

1. Detachable visor window exceeds maximum overheat temperature, but 28 V at pin U not cycling off/on (also, O/HEAT caption not illuminated) - transpose Controllers (69) and (70). Has fault cleared? If YES, renew faulty Controller (69) or (70). If NO, carry out a resistance check of the window sensing elements (Ref. Adjustment/Test); transfer the wiring to the spare
R sensing element (Ref. Approved
R Repairs), or renew Window (67) or (68) as necessary.
2. Detachable visor window exceeds maximum overheat temperature, but 28 V at pin U not cycling off/on (also, O/HEAT caption illuminated continuously) - renew Relay (59) or (60).

D.V. AND SIDE WINDOWS NOT HEATING UP, AND 28 V NOT AVAILABLE AT TEST SOCKET PIN 1C.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

<u>NOTE</u>: Before renewal of components (*), check the associated wiring for continuity.

Set the left (right) D.V. DEMIST switch to the "ON" position.

→ Check for 28 V d.c. at pin 1A of test socket UT1801 (UT1802).

- YES → Carry out a continuity check on the DV window thermostat (Ref. Adjustment/Test). Transfer the wiring to the spare normal thermostat (Ref. (Approved Repairs), or *renew D.V. Window (13) or (14) as necessary.
- NO → Check for a 28 V output at CB (1) or (2).
  - NO → Renew CB (1) or (2).
  - YES → Remove Relay (9) or (10) and check for 28 V at pin B2 of the relay socket.
    - NO → *Renew Switch (5) or (6).

Chart 101

```
*******************************
*D.V. AND SIDE WINDOWS NOT    *
*HEATING UP, AND 28 V AT TEST *
*SOCKET PIN 1C NOT CYCLING    *
*OFF/ON.                      *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 ----------------          ----------------          ----------------
|Set the left    |-----|Is O/HEAT caption|--NO-|*Renew Relay (7) |
|(right) D.V.    |     |illuminated?     |      |or (8).          |
|DEMIST switch to|      ----------------          ----------------
|the "ON"        |             |
|position.       |            YES
 ----------------              |
                           ----------------          ----------------
                          |Check for 28 V   |-NO--|Carry out a      |
                          |at pin 1A of test|     |continuity check |
                          |socket UT1801    |     |on the side      |
                          |(UT1802).        |     |window thermostat|
                           ----------------       |(Ref. Adjustment/|
                                  |               |Test). Transfer  |
                                 YES              |the wiring to the|
                                  |               |spare overheat   |
R                          ----------------       |thermostat (Ref. |
R                         |*Renew Relay (9) |     |Approved Repairs)|
                          |or (10).         |     |or *renew Side   |
                           ----------------       |Window (15) or   |
                                                  |(16) as          |
                                                  |necessary.       |
                                                   ----------------
```

Chart 102

```
********************************
*28 V AT TEST SOCKET PIN 1C    *
*NOT CYCLING OFF/ON, BUT       *
*'O/HEAT' CAPTION CYCLING      *
*ON/OFF AFTER APPROXIMATELY    *
*30 min.                       *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-
RESISTANCE METER	CROYDON PRECISION INSTRUMENT TYPE PW2

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set the left (right) D.V. DEMIST switch to the "ON" position.
→ Is D.V. window heating up?
- NO → Carry out a resistance check of the D.V. window heating element (Ref. Adjustment/Test). *Renew the Window (13) or (14) as necessary.
- YES → Is the heating operating below the normal thermostat switch-off temperature of 55(±5) deg C?
  - NO → R R Transfer the wiring to the spare normal thermostat (Ref. Approved Repairs) or *renew the D.V. Window (13) or (14) as necessary.
  - YES → R R Transfer the wiring to the spare overheat thermostat (Ref. Approved Repairs) or *renew the Side Window (15) or (16) as necessary.

Chart 103

D.V. AND SIDE WINDOWS EXCEED MAXIMUM OVERHEAT TEMPERATURE, BUT 'O/HEAT' CAPTION NOT ILLUMINATED.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Return the D.V. DEMIST switch to "OFF", connect a link between test socket pins 1A and 1C, then set the D.V. DEMIST switch to "ON".

→ Is a steady 28 V available at test socket pin 1C?

- NO → *Renew Relay (9) or (10).
- YES → Transfer the wiring to the spare overheat thermostat (Ref. Approved Repairs) or *renew the Side Window (15) or (16) as necessary.

R
R

Chart 104

****
*ONE-THIRD OR TWO-THIRDS OF *
*WINDSHIELD NOT HEATING UP *
*(ALSO, 'O/HEAT' CAPTION MAY *
*CYCLE ON/OFF AFTER APPROX- *
*IMATELY 8 min). *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TESTMETER, E.G., AVOMETER TYPE 8	-
RESISTANCE METER	CROYDON PRECISION INSTRUMENT TYPE PW2

NOTE: Before renewal of components (*), check the associated wiring for continuity.

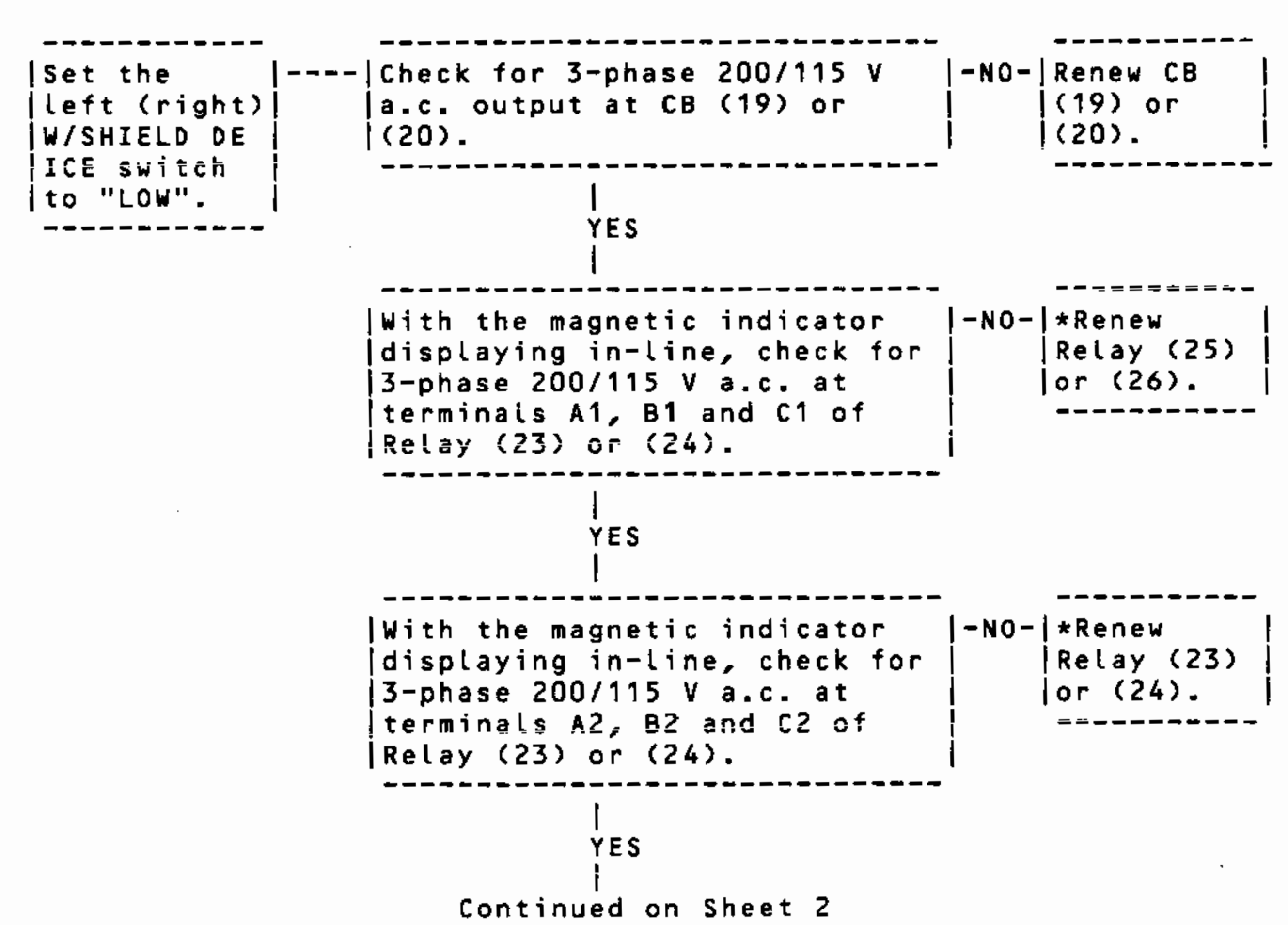


Chart 105 (Sheet 1 of 2)

Continued from Sheet 1

YES

Check for an earth at terminals A2, B2 and C2 of Relay (27) or (28).

-NO- → *Renew Relay (27) or (28).

YES

Is the unheated one-third or two-thirds the inboard (A-phase) and/or outboard (C-phase) section of the windshield?

-YES- → Carry out a resistance check of the appropriate heating element or elements (Ref. Adjustment/Test). Renew Windshield (33) or (34) as necessary.

NO

Unheated section of windshield must be centre (B-phase) section. Check for continuity between terminals 1 and 2 and then 4 and 5 of Switch (35) or (36).

-YES- → Carry out a resistance check of the windshield centre section (B-phase) heating element (Ref. Adjustment/Test). Renew Windshield (33) or (34) as necessary.

NO

Renew Switch (35) or (36).

Chart 105 (Sheet 2 of 2)

LEFT WINDSHIELD NOT HEATING UP.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TESTMETER, E.G., AVOMETER TYPE 8	-
RESISTANCE METER	CROYDON PRECISION INSTRUMENT TYPE PW2

NOTE: Before renewal of components (*), check the associated wiring for continuity.

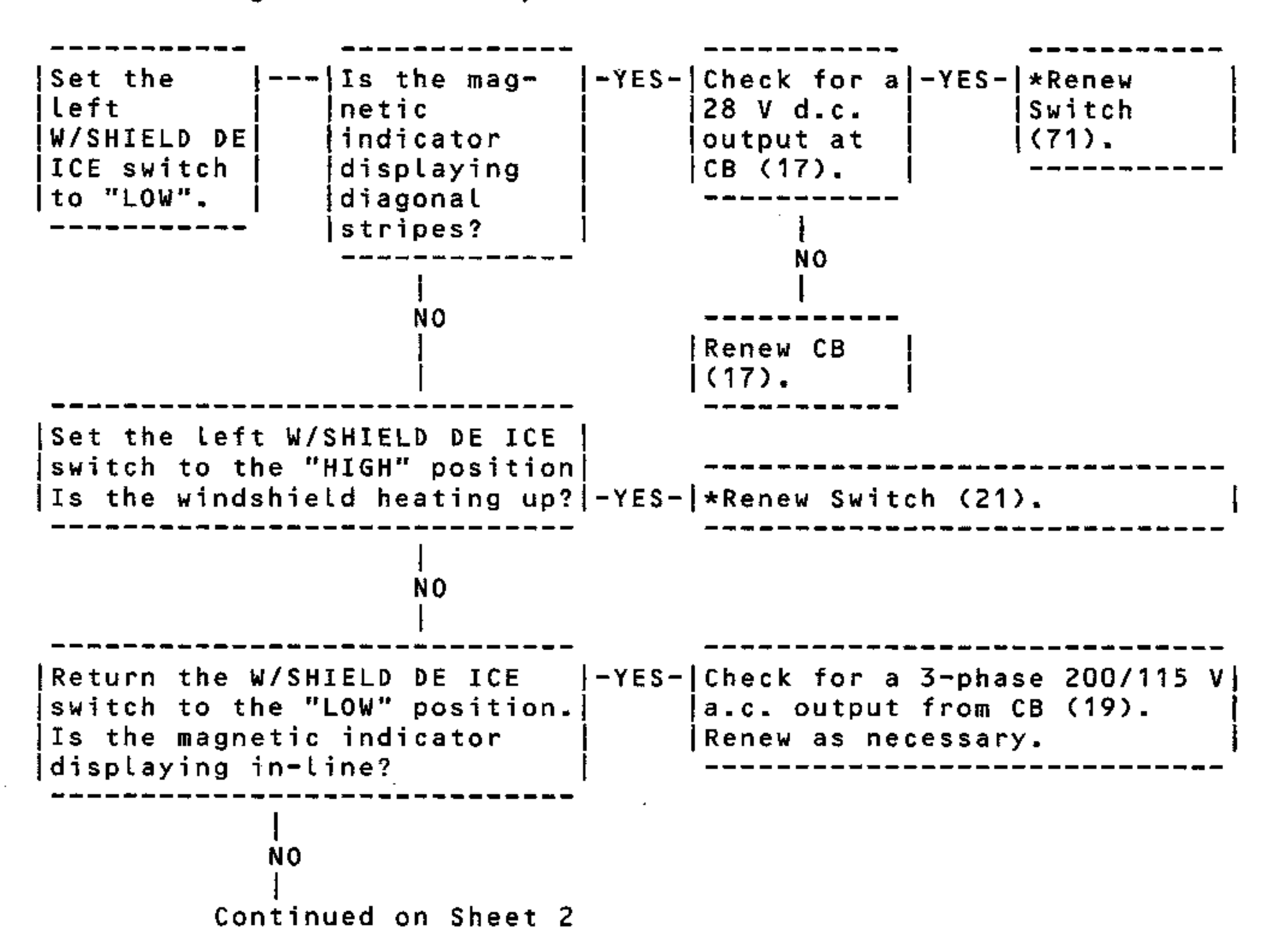


Chart 106 (Sheet 1 of 2)

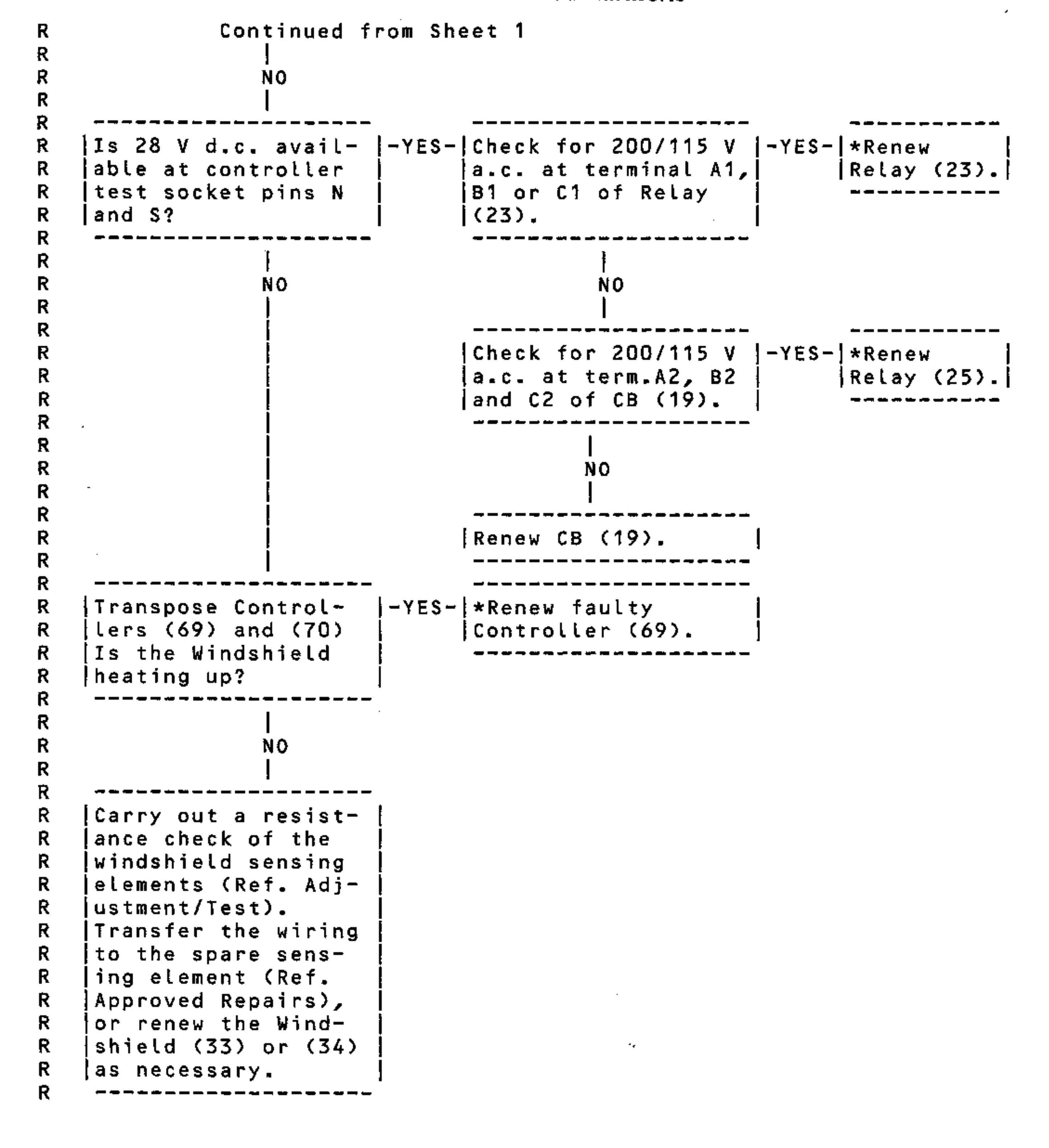


Chart 106 (Sheet 2 of 2)

```
*****************************
*RIGHT WINDSHIELD NOT HEATING *
*UP.                          *
*****************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TESTMETER, E.G., AVOMETER TYPE 8	-
RESISTANCE METER	CROYDON PRECISION INSTRUMENT TYPE PW2

NOTE: Before renewal of components (*), check the associated wiring for continuity.

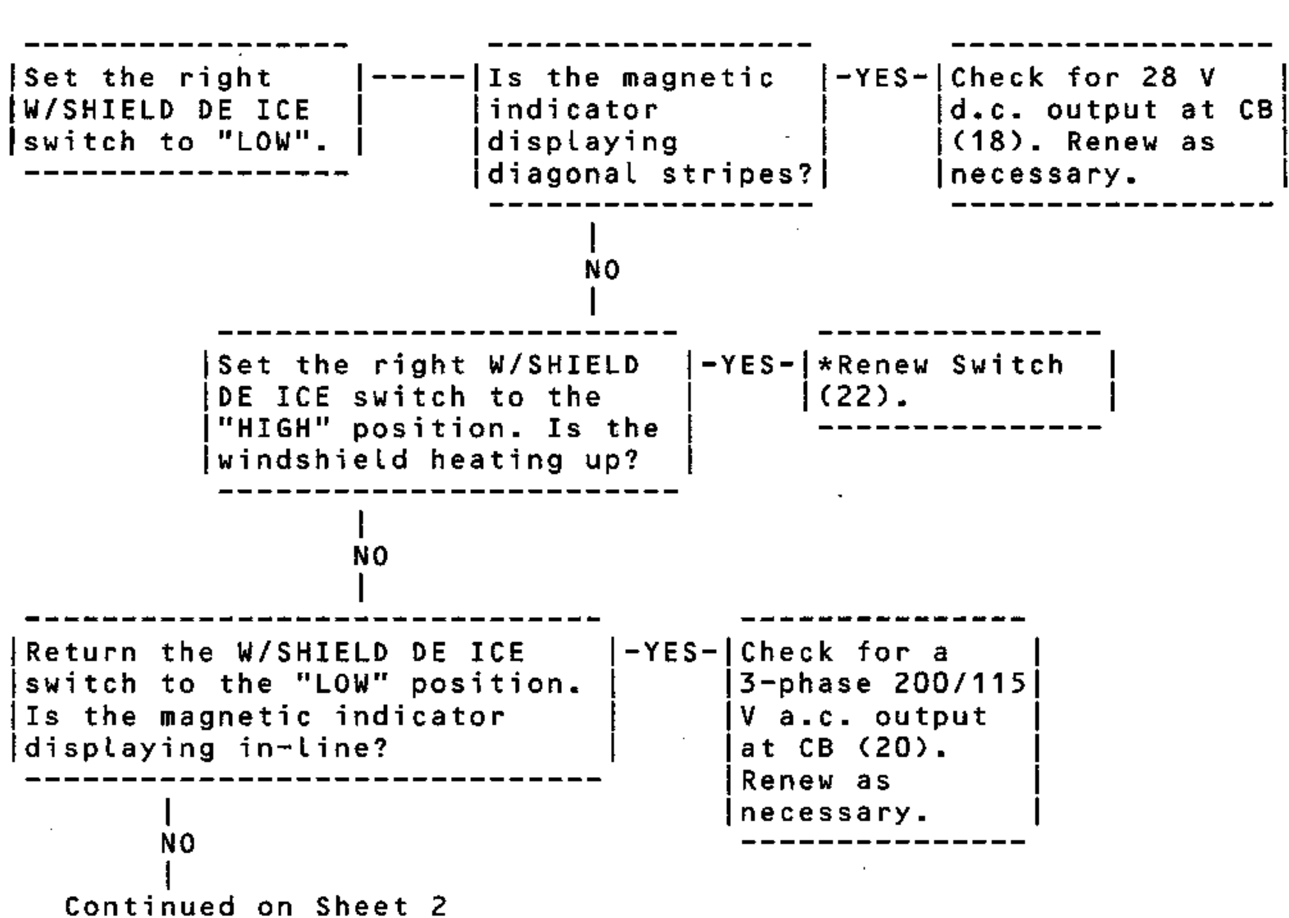


Chart 107 (Sheet 1 of 2)

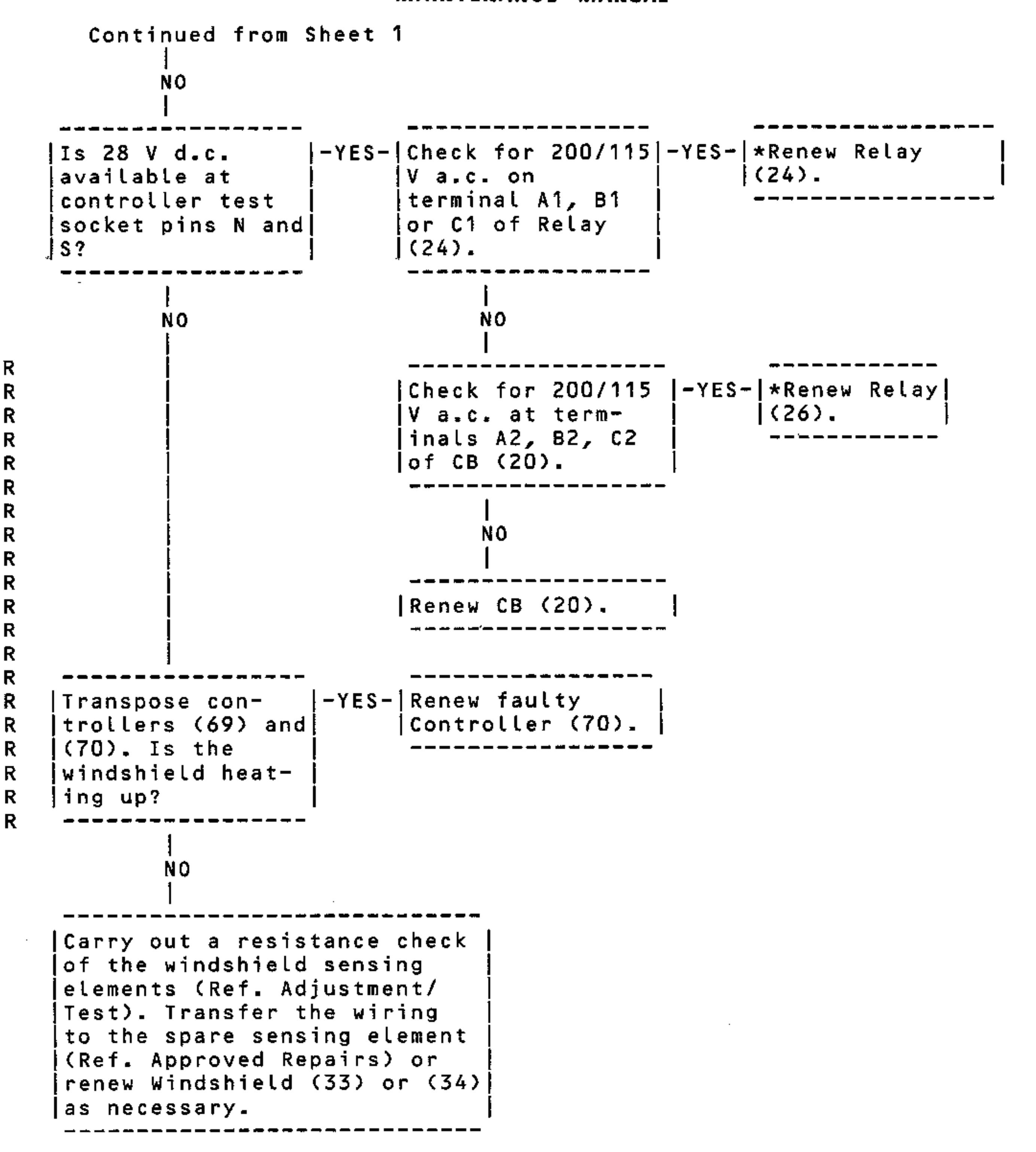


Chart 107 (Sheet 2 of 2)

```
*******************************            -------------------------------
*MAGNETIC INDICATOR DISPLAYS  *           |GROUND EQUIPMENT REQUIRED      |
*DIAGONAL STRIPES WITH WIND-  *           |-------------------------------|
*SHIELD DE-ICING SWITCHED ON. *           |DESCRIPTION          PART NO.  |
*******************************           |-------------------------------
                                          |GROUND POWER SUPPLY  -         |
                                          |TESTMETER, E.G.,        -      |
                                          |AVOMETER TYPE 8                |
                                           -------------------------------
```

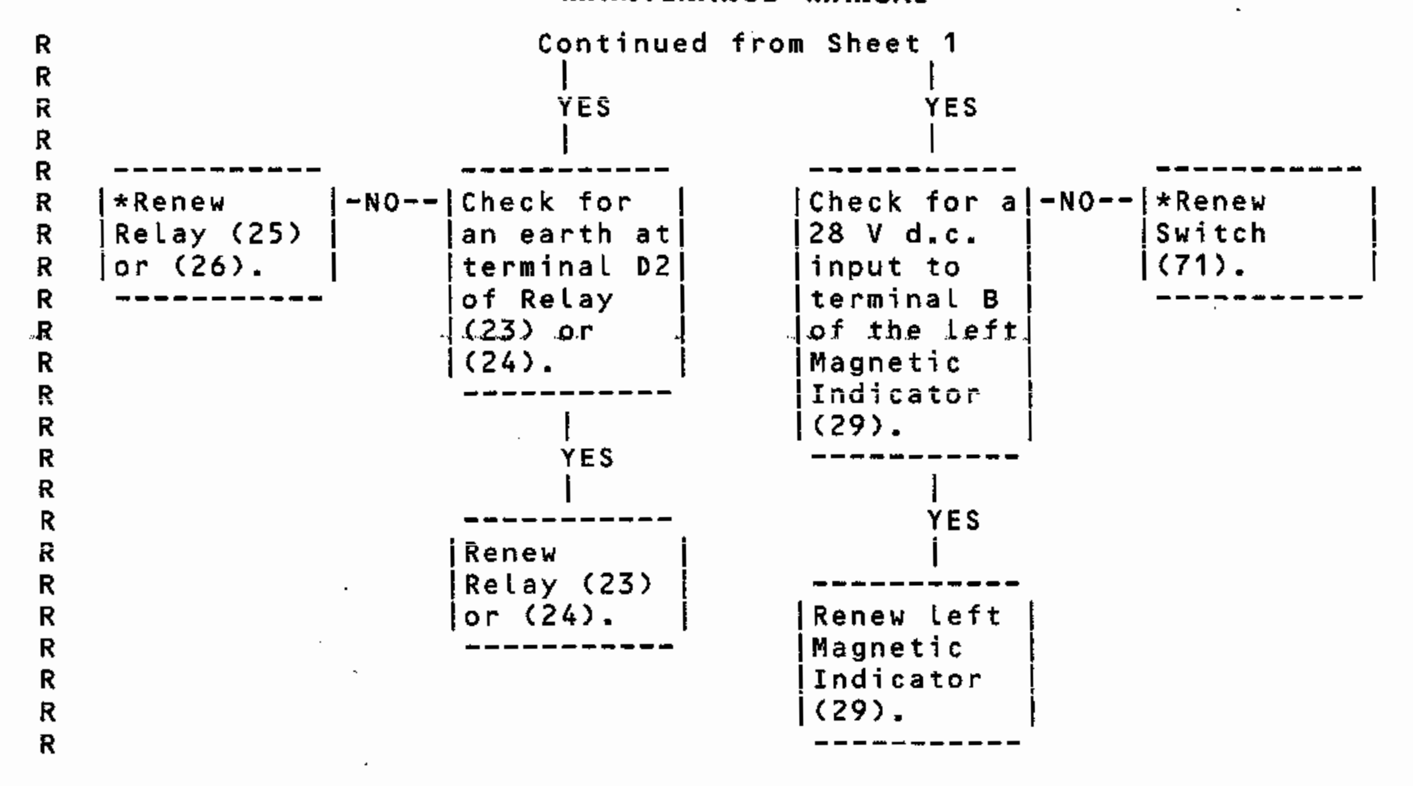
NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 -----------        -----------        -----------        -----------
|Set the    |-----|Is the     |-NO--|Check for a|-NO--|Renew CB   |
|left(right)|     |windshield |     |28 V d.c.  |     |(17) or    |
|W/SHIELD DE|     |heating up?|     |output from|     |(18).      |
|ICE switch |      -----------      |CB (17) or |      -----------
|to "LOW".  |           |           |(18).      |
 -----------           YES           -----------
                        |                 |
 -----------        -----------          YES
|*Renew     |-YES-|Check for  |           |
|Magnetic   |     |an earth at|      -----------        -----------
|Indicator  |     |terminal D1|     |Is it the  |-NO--|*Renew     |
|(29) or    |     |or D3 of   |     |left (L)   |     |right (R)  |
|(30).      |     |Relay (23) |     |magnetic   |     |Magnetic   |
 -----------      |or (24).   |     |indicator  |     |Indicator  |
                   -----------      |that is    |     |(30).      |
                        |           |displaying |      -----------
                        NO          |diagonal   |
                        |           |stripes?   |
 -----------        -----------      -----------
|Reinstate  |-NO--|Check for  |           |
|earth as   |     |an earth at|          YES
|necessary. |     |terminal D2|           |
 -----------      |of Relay   |           |
                  |(25) or    |           |
                  |(26).      |           |
                   -----------            |
                        |                 |
                       YES                |
                        |                 |
```

Continued on Sheet 2

Chart 108 (Sheet 1 of 2)

Continued from Sheet 1



R Chart 108 (Sheet 2 of 2)

```
*********************************
*LOW POWER (115 V AC) APPLIED  *
*TO WINDSHIELD HEATING         *
*ELEMENTS WITH HIGH POWER      *
*SELECTED.                     *
*********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 -----------   -------------------          -------------------
|Set the left|----|Check for 28 V d.c. |-YES-|*Renew Relay (27) or|
|(right)     |    |at terminal X1 of   |     |(28).               |
|W/SHIELD DE |    |Relay (27) or (28). |      -------------------
|ICE switch  |     -------------------
|to "HIGH".  |              |
 -----------                NO
                            |
                   -------------------          -------------------
                  |Lower panel 4-211;  |--NO-|Suspect auto-shed   |
                  |then, for the left  |     |breaker. For further|
                  |system only, check  |     |trouble shooting,   |
                  |for a 28 V input to |     |refer to 24-22-00.  |
                  |terminal 5 of Switch|      -------------------
                  |(21).               |
                   -------------------
                            |
                           YES
                            |
                   -------------------          -------------------
                  |For the left or     |-NO--|*Renew Switch (21)  |
                  |right system, check |     |or (22).            |
                  |for a 28 V output at|      -------------------
                  |terminal 6 of Switch|
                  |(21) or (22).       |
                   -------------------
                            |
                           YES
                            |
```

Continued on Sheet 2

R Chart 109 (Sheet 1 of 2)

```
      Continued from Sheet 1
                  |
                 YES
                  |
       --------------------       --------------------
R      |Remove Relay (74) or|--NO-|*Renew Relay (72) or|
R      |(75) and check for  |     |(73).               |
       |28 V at pin C       |     --------------------
       |(pin A) of the relay|
       |socket.             |
       --------------------
                  |
                 YES
                  |
       --------------------       --------------------
       |Check for 28 V at   |-NO--|Suspect visor uplock|
       |pin X1 of the relay |     |relay control       |
       |socket.             |     |circuit.  For       |
       --------------------       |further trouble     |
                  |               |shooting refer to   |
                 YES              |27-61-00.           |
                  |               --------------------
       --------------------
       |Connect a link      |
       |between pins C and 6|     --------------------
       |(pins A and 2) of   |--NO-|Check wiring between|
R      |the relay socket.   |     |Relays (74) and (27)|
R      |Has fault cleared?  |     |((75) and (28)).    |
       --------------------       |Rectify as          |
                  |               |necessary.          |
                 YES              --------------------
                  |
       --------------------
R      |Renew Relay (74) or |
R      |(75).               |
       --------------------
```

R Chart 109 (Sheet 2 of 2)

```
*******************************
*ONE-THIRD OR TWO-THIRDS OF   *
*MAIN (FLAT) VISOR WINDOW NOT *
*HEATING UP (ALSO, 'O/HEAT'   *
*CAPTION MAY CYCLE ON/OFF     *
*AFTER APPROXIMATELY 8 min).  *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TWO MULTIMETERS (E.G., AVOMETERS)	-
RESISTANCE METER	CROYDON PRECISION INSTRUMENT TYPE PW2

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 ------------      ---------------------------          ------------
|Set the left|----|Check for 3-phase 200/115 V |--NO-|Renew CB    |
|(right)     |    |a.c. output at CB (41) or   |     |(41) or     |
|VISOR DE ICE|    |(42).                       |     |(42).       |
|switch to   |     ---------------------------          ------------
|the "ON"    |                |
|position.   |               YES
 ------------                 |
        --------------------------------------         ------------
       |With the 28 V at controller test soc-|--NO-|*Renew Relay|
       |ket pin j cycled 'on', check for 3-  |     |(55) or     |
       |phase 200/115 V a.c. at terminals A2,|     |(56).       |
       |B2 and C2 of Relay (49) or (50).     |      ------------
        --------------------------------------
                              |
                             YES
                              |
        --------------------------------------         ------------
       |With the 28 V at controller test soc-|--NO-|*Renew Relay|
       |ket pin j cycled 'on', check for 3-  |     |(49) or     |
       |phase 200/115 V a.c. at terminals A1,|     |(50).       |
       |B1 and C1 of Relay (49) or (50).     |      ------------
        --------------------------------------
                              |
                             YES
                              |
      -------------------------------------------
     |Carry out a resistance check of the window|
     |heating elements (Ref. Adjustment/Test).  |
     |*Renew Window (63) or (64) as necessary.  |
      -------------------------------------------
```

Chart 110

MAIN (FLAT) VISOR WINDOW NOT HEATING UP.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-
RESISTANCE METER	CROYDON PRECISION INSTRUMENT TYPE PW2

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set the left (right) VISOR DE ICE switch to the "ON" position.

→ Is 28 V d.c. available at controller test socket pin g?

- NO → Check for a 28 V output at CB (37) or (38).
  - NO → Renew CB (37) or (38).
  - YES → Lower panel 4-211 and check for a 28 V output at terminal 3 of Switch (47) or (48).
    - NO → *Renew Switch (47) or (48).
    - YES → Remove Relay (76) or (75) and check for continuity between pins B2 and B3 of relay (76) or pins E and 9 of relay (75).
      - NO → *Renew Relay (76) or (75).
      - YES → (continued)
- YES → (continued)

Continued on Sheet 2

Chart 111 (Sheet 1 of 3)

Continued from Sheet 1

R R R R R R R R R

Check aircraft wiring between Relay (76) and Temp. Controller (69) or Relay (75) and Temp. Controller (70)

Is 28 V available at controller test socket pins j and n?

-NO- Transpose Controllers (69) and (70). Is window heating up?

-NO- Carry out a resistance check of the window sensing elements (Ref. Adjustment/ Test). Transfer the wiring to the spare sensing element (Ref. Approved Repairs), or *renew Window (63) or (64) as necessary.

YES

Renew faulty Controller (69) or (70).

YES

Check for 3-phase 200/ 115 V a.c. output at CB (41) or (42).

-NO- Renew CB (41) or (42).

YES

Check for 3-phase 200/ 115 V a.c. at terminals A2, B2 and C2 of Relay (49) or (50).

-NO- *Renew Relay (55) or (56).

YES

Continued on Sheet 3

Chart 111 (Sheet 2 of 3)

```
Continued from Sheet 2
            |
           YES
            |
 ----------------------            ---------------
|Check for 3-phase 200/|-NO-|Renew Relay    |
|115 V a.c. at termin- |    |(49) or (50).  |
|als A1, B1 and C1 of  |     ---------------
|Relay (49) or (50).   |
 ----------------------
            |
           YES
            |
R  --------------------------
R |Carry out resistance check|
R |of the window heating     |
R |elements (Ref. 30-41-00,  |
R |Adjustment/Test). Renew   |
R |window (63) or (64) as    |
R |necessary.                |
R  --------------------------
```

Chart 111 (Sheet 3 of 3)

ONE-THIRD OR TWO-THIRDS OF CURVED VISOR WINDOW NOT HEATING UP (ALSO, 'O/HEAT' CAPTION MAY CYCLE ON/OFF AFTER APPROXIMATELY 8 min).

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
TWO MULTIMETERS (E.G., AVOMETERS)	-
RESISTANCE METER	CROYDON PRECISION INSTRUMENT TYPE PW2

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set the left (right) VISOR DE ICE switch to the "ON" position. ---- Check for 3-phase 200/115 V a.c. output at CB (43) or (44). --NO-- Renew CB (43) or (44).

YES

With the 28 V at controller test socket pin P cycled 'on', check for 3-
R phase 200/115 V a.c. at terminals A2,
R B2 and C2 of Relay (51) or (52). --NO-- *Renew Relay (57) or (58).

YES

With the 28 V at controller test socket pin P cycled 'on', check for 3-
R phase 200/115 V a.c. at terminals A1, B1 and C1 of Relay (51) or (52). --NO-- *Renew Relay (51) or (52).

YES

Carry out a resistance check of the window heating elements (Ref. Adjustment/Test). *Renew Window (65) or (66) as necessary.

Chart 112

*CURVED VISOR WINDOW NOT HEATING UP.

GROUND EQUIPMENT REQUIRED

DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-
RESISTANCE METER	CROYDON PRECISION INSTRUMENT TYPE PW2

NOTE: Before renewal of components (*), check the associated wiring for continuity.

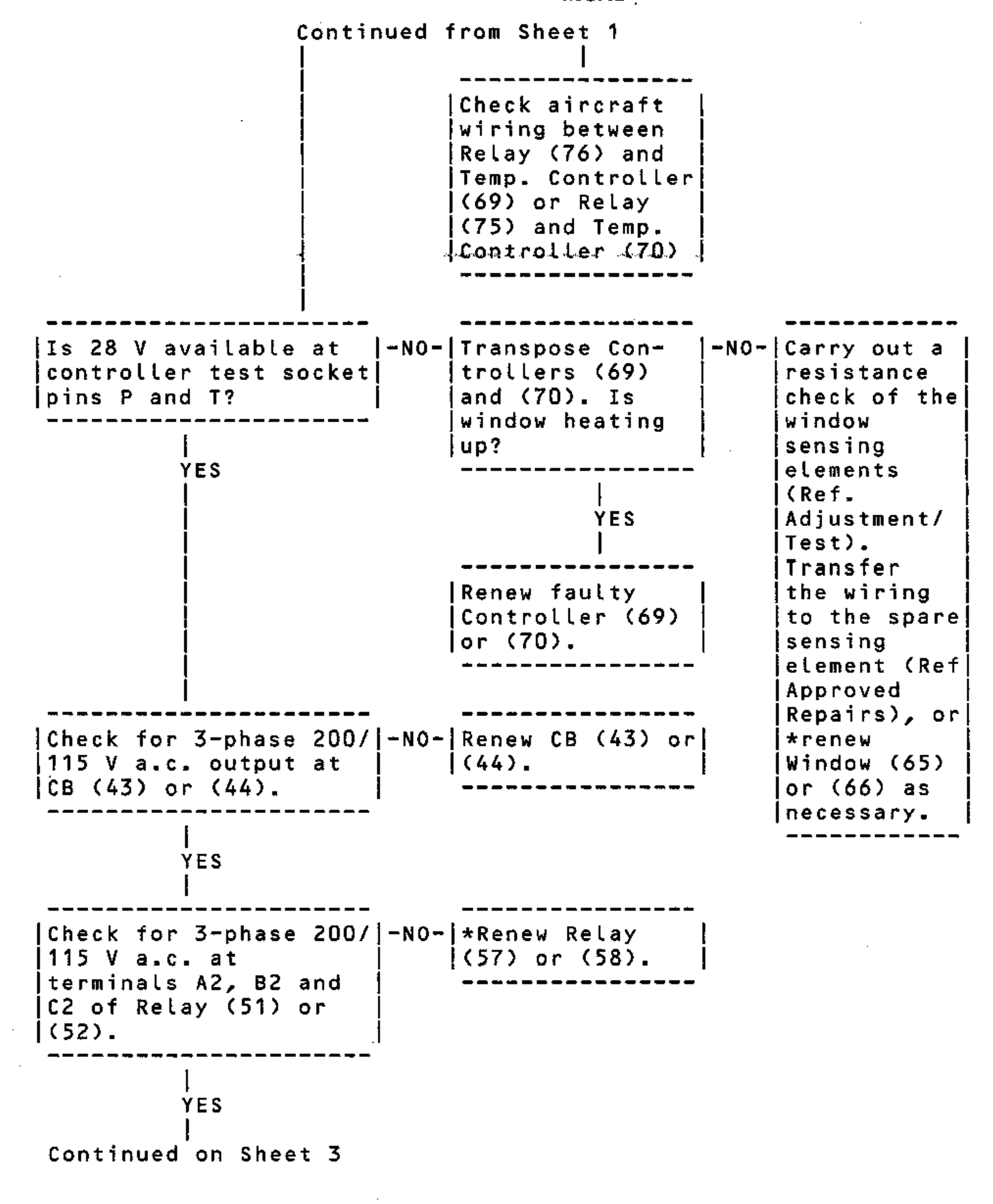
Set the left (right) VISOR DE ICE switch to the "ON" position. → Is 28 V d.c. available at controller test socket pin f?

- NO → Check for a 28 V output at CB (39) or (40).
  - NO → Renew CB (39) or (40).
  - YES → Lower panel 4-211 and check for a 28 V output at terminal 6 of Switch (47) or (48).
    - NO → *Renew Switch (47) or (48).
    - YES → Remove Relay (76) or (75) and check for continuity between pins C2 and C3 of relay (76) or pins F and 11 of relay (75).
      - NO → *Renew Relay (76) or (75).
      - YES → Continued on Sheet 2
- YES → Continued on Sheet 2

Chart 113 (Sheet 1 of 3)

Printed in England

Continued from Sheet 1



Continued on Sheet 3

Chart 113 (Sheet 2 of 3)

Continued from Sheet 2

```
               |
              YES
               |
    ----------------------      ---------------
   |Check for 3-phase 200/|-NO-|Renew Relay   |
   |115 V a.c. at termin- |    |(51) or (52). |
   |als A1, B1 and C1 of  |     ---------------
   |Relay (51) or (52).   |
    ----------------------
               |
              YES
               |
R   --------------------------
R  |Carry out resistance check|
R  |of the window heating     |
R  |elements (Ref. 30-41-00,  |
R  |Adjustment/Test). Renew   |
R  |window (65) or (66) as    |
R  |necessary.                |
R   --------------------------
```

Chart 113 (Sheet 3 of 3)

****
*DETACHABLE VISOR WINDOW *
*NOT HEATING UP. *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-
RESISTANCE METER	CROYDON PRECISION INSTRUMENT TYPE PW2

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set the left (right) VISOR DE ICE switch to the "ON" position.

→ Is 28 V d.c. available at controller test socket pin M?

- NO → Check for a 28 V output at CB (39) or (40).
  - NO → Renew CB (39) or (40).
  - YES → Lower panel 4-211 and check for a 28 V output from terminal 9 of Switch (47) or (48).
    - NO → *Renew Switch (47) or (48).
    - YES → Remove Relay (76) or (75) and check for continuity between pins D2 and D3 of relay (76) or pins G and 13 of relay (75).
      - NO → *Renew Relay (76) or (75).
      - YES
- YES

Continued on Sheet 2

Chart 114 (Sheet 1 of 3)

Continued from Sheet 1

Check aircraft wiring between Relay (76) and Temp. Controller (69) or Relay (75) and Temp. Controller (70)

Is 28 V available at controller test socket pins R and U?

- NO → Transpose Controllers (69) and (70). Is window heating up?
  - YES → Renew faulty Controller (69) or (70).
  - NO → Carry out a resistance check of the window sensing elements (Ref. Adjustment/Test). Transfer the wiring to the spare sensing element (Ref Approved Repairs), or *renew Window (67) or (68) as necessary.
- YES ↓

Check for a 115 V a.c. output from CB (45) or (46).

- NO → Renew CB (45) or (46).
- YES ↓

Check for 115 V a.c. at terminal A2 of Relay (53) or (54).

- NO → *Renew Relay (59) or (60).
- YES ↓

Continued on Sheet 3

Chart 114 (Sheet 2 of 3)

Continued from Sheet 2

YES

Check	NO
Check for 115 V a.c. at terminal A1 of Relay (53) or (54).	Renew Relay (53) or (54).

YES

Check	NO
Carry out a resistance check of the window heating element (Ref. Adjustment/Test).	*Renew Window (67) or (68).

YES

Check for an earth at visor window free connector U1035-B (U1036-B) pin s. Rectify as necessary.

R Chart 114 (Sheet 3 of 3)

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
D.V. and Side Windows						
(1) Circuit breaker 28 V	-	15-215	1H182	Map ref.C10	24-50-00 R/I	30-41-41
(2) Circuit breaker 28 V	-	15-216	2H182	Map ref.C14	24-50-00 R/I	30-41-42
(3) Circuit breaker 115 V	-	14-215	1H181	Map ref.D9	24-50-00 R/I	30-41-41
(4) Circuit breaker 115 V	-	13-216	2H181	Map ref.C10	24-50-00 R/I	30-41-42
(5) D.V. DEMIST control switch	-	4-211	1H186	Flt. compt. roof panel	30-00-00 R/I	30-41-41
(6) D.V. DEMIST control switch	-	4-211	2H186	Flt. compt. roof panel	30-00-00 R/I	30-41-42
(7) Normal control relay	-	13-123	1H184	LH ice relay box	30-00-00 R/I	30-41-41
(8) Normal control relay	-	16-123	2H184	RH ice relay box	30-00-00 R/I	30-41-42
(9) Overheat control relay	-	13-123	1H183	LH ice relay box	30-00-00 R/I	30-41-41
(10) Overheat control relay	-	16-123	2H183	RH ice relay box	30-00-00 R/I	30-41-42
(11) O/HEAT caption	-	4-211	1H185	Flt. compt. roof panel	30-00-00 R/I	30-41-41
(12) O/HEAT caption	-	4-211	2H185	Flt. compt. roof panel	30-00-00 R/I	30-41-42
(13) D.V. window	-	211	1H187	Flt. compt. LH	56-11-11 R/I	30-41-41
(14) D.V. window	-	211	2H187	Flt. compt. RH	56-11-11 R/I	30-41-42

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(15) Side window	-	211	1H188	Flt. compt. LH	56-11-21 R/I	30-41-41
(16) Side window	-	211	2H188	Flt. compt. RH	56-11-21 R/I	30-41-42
Windshields						
(17) Circuit breaker 28 V	-	1-213	1H142	Map ref.H9	24-50-00 R/I	30-41-01
(18) Circuit breaker 28 V	-	15-216	2H142	Map ref.B17	24-50-00 R/I	30-41-02
(19) Circuit breaker 200/ 115 V	-	2-213	1H141	Map ref.G19	24-50-00 R/I	30-41-01
(20) Circuit breaker 200/ 115 V	-	14-216	2H141	Map ref.F11	24-50-00 R/I	30-41-02
(21) W/SHIELD DE ICE control switch	-	4-211	1H148	Flt. compt. roof panel	30-00-00 R/I	30-41-01
(22) W/SHIELD DE ICE control switch	-	4-211	2H148	Flt. compt. roof panel	30-00-00 R/I	30-41-02
(23) Normal control relay	-	21-123	1H144	LH ice cont. box	30-00-00 R/I	30-41-01
(24) Normal control relay	-	23-123	2H144	RH ice cont. box	30-00-00 R/I	30-41-02
(25) Overheat control relay	-	21-123	1H143	LH ice cont. box	30-00-00 R/I	30-41-01
(26) Overheat control relay	-	23-123	2H143	RH ice cont. box	30-00-00 R/I	30-41-02
(27) High/low	-	21-123	1H145	LH ice	30-00-00	30-41-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
control relay				cont. box	R/I	
(28) High/low control relay	-	23-123	2H145	RH ice cont. box	30-00-00 R/I	30-41-02
(29) Magnetic indicator	-	4-211	1H152	Flt. compt. roof panel	30-00-00 R/I	30-41-01
(30) Magnetic indicator	-	4-211	2H152	Flt. compt. roof panel	30-00-00 R/I	30-41-02
(31) O/HEAT caption	-	4-211	1H147	Flt. compt. roof panel	30-00-00 R/I	30-41-01
(32) O/HEAT caption	-	4-211	2H147	Flt. compt. roof panel	30-00-00 R/I	30-41-02
(33) Wind-shield	-	211	1H146	Flt. compt. LH	56-11-31 R/I	30-41-01
(34) Wind-shield	-	211	2H146	Flt. compt. RH	56-11-31 R/I	30-41-02
(35) W/SHIELD EMERGY DE-ICE switch	-	3-213	1H151	CB panel	30-41-00 R/I	30-41-01
(36) W/SHIELD EMERGY DE-ICE switch	-	3-213	2H151	CB panel	30-41-00 R/I	30-41-02
Visor Windows						
(37) Circuit breaker 28 V	-	15-215	1H222	Map ref.C11	24-50-00 R/I	30-41-07
(38) Circuit breaker 28 V	-	15-216	2H222	Map ref.C15	24-50-00 R/I	30-41-07
(39) Circuit breaker 28 V	-	15-215	1H224	Map ref.C12	24-50-00 R/I	30-41-08

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(40) Circuit breaker 28 V	-	15-216	2H224	Map ref.C16	24-50-00 R/I	30-41-08
(41) Circuit breaker 200/ 115 V	-	14-215	1H221	Map ref.G5	24-50-00 R/I	30-41-07
(42) Circuit breaker 200/ 115 V	-	13-216	2H221	Map ref.G13	24-50-00 R/I	30-41-07
(43) Circuit breaker 200/ 115 V	-	14-215	1H223	Map ref.G6	24-50-00 R/I	30-41-08
(44) Circuit breaker 200/ 115 V	-	13-216	2H223	Map ref.G10	24-50-00 R/I	30-41-08
(45) Circuit breaker 115 V	-	14-215	1H225	Map ref.E9	24-50-00 R/I	30-41-09
(46) Circuit breaker 115 V	-	13-216	2H225	Map ref.B9	24-50-00 R/I	30-41-09
(47) VISOR DE ICE control switch	-	4-211	1H233	Flt. compt. roof panel	30-00-00 R/I	30-41-07
(48) VISOR DE ICE control switch	-	4-211	2H233	Flt. compt. roof panel	30-00-00 R/I	30-41-07
(49) Main flat, normal control relay	-	13-123	1H227	LH ice relay box	30-00-00 R/I	30-41-07
(50) Main flat, normal control relay	-	16-123	2H227	RH ice relay box	30-00-00 R/I	30-41-07
(51) Curved, normal control relay	-	13-123	1H229	LH ice relay box	30-00-00 R/I	30-41-08

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(52) Curved, normal control relay	-	16-123	2H229	RH ice relay box	30-00-00 R/I	30-41-08
(53) Detach., normal control relay	-	13-123	1H231	LH ice relay box	30-00-00 R/I	30-41-09
(54) Detach., normal control relay	-	16-123	2H231	RH ice relay box	30-00-00 R/I	30-41-09
(55) Main flat, overheat control relay	-	13-123	1H226	LH ice relay box	30-00-00 R/I	30-41-07
(56) Main flat, overheat control relay	-	16-123	2H226	RH ice relay box	30-00-00 R/I	30-41-07
(57) Curved, overheat control relay	-	13-123	1H228	LH ice relay box	30-00-00 R/I	30-41-08
(58) Curved, overheat control relay	-	16-123	2H228	RH ice relay box	30-00-00 R/I	30-41-08
(59) Detach., overheat control relay	-	13-123	1H230	LH ice relay box	30-00-00 R/I	30-41-09
(60) Detach., overheat control relay	-	16-123	2H230	RH ice relay box	30-00-00 R/I	30-41-09
(61) O/HEAT caption	-	4-211	1H232	Flt. compt. roof panel	30-00-00 R/I	30-41-07
(62) O/HEAT caption	-	4-211	2H232	Flt. compt. roof panel	30-00-00 R/I	30-41-07
(63) Main flat window	-	112	1H234	Visor, LH	56-11-41 R/I	30-41-07

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(64) Main flat window	-	112	2H234	Visor, RH	56-11-41 R/I	30-41-07
(65) Curved window	-	112	1H235	Visor, LH	56-11-41 R/I	30-41-08
(66) Curved window	-	112	2H235	Visor, RH	56-11-41 R/I	30-41-08
(67) Detach. window	-	112	1H236	Visor, LH	56-11-41 R/I	30-41-09
(68) Detach. window	-	112	2H236	Visor, RH	56-11-41 R/I	30-41-09
Windshields and Visor Windows						
(69) Temperature controller	-	10-215	1H149	Flt. compt. racking	30-41-11 R/I	30-41-01
(70) Temperature controller	-	9-216	2H149	Flt. compt. racking	30-41-11 R/I	30-41-02
Associated Equipment						
(71) Emergency relight busbar switch	-	18-214	X229	Engine starting panel	24-22-00 R/I	24-51-06
(72) Weight switch relay	-	2-213	G302	LH hydraulic relay box	32-61-** R/I	32-61-06
(73) Weight switch relay	-	3-123	G312	RH hydraulic relay	32-61-** R/I	32-61-06

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
				box		
(74) Visor uplock relay	-	2-123	M18	LH hyd-raulic relay box	27-61-00 R/I	27-61-01
(75) Visor uplock relay	-	3-123	M20	LH hyd-raulic relay box	27-61-00 R/I	27-61-51
(76) Visor uplock relay	-	2-123	M19	RH hyd-raulic relay box	27-61-00 R/I	27-61-51

Component Identification
Table 101

FLIGHT COMPARTMENT AND VISOR WINDOW AND WINDSHIELD HEATING - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

This topic contains instructions for the removal and installation of minor electrical components, comprising two W/SHIELD EMERGY DE-ICE control switches and two diodes, associated with the windshield de-icing. Instructions for the removal and installation of other minor electrical components associated with this sub-system, located on the flight compartment roof panel, in the ice relay boxes and the air/ice contactor boxes, are contained in 30-00-00.

Both W/SHIELD EMERGY DE-ICE control switches are of the toggle type, assembled on a fixed mounting bracket that forms a part of the essential d.c. circuit breaker panel, 3-213. The switches are mounted from the rear of the bracket, access being gained by lowering the circuit breaker panel on its hinges. A spring-operated hinged cover fitted on the front of the bracket forms a switch guard, and is held in the closed position, against spring pressure, by manually breakable locking wire. Electrical connections to the switch are made to screw-type terminals.

The two diodes are soldered to barb insulators fitted to a small diode board on the back of the mounting bracket.

2. Switch

A. Equipment and Materials

DESCRIPTION	PART NO.
Fuse wire (tinned copper), 0.018 in (0.457 mm) dia., for locking switch guard	-

B. Prepare to Remove Switch

(1) Isolate the electrical generation and external power supplies as detailed in 24-00-00, Servicing.

(2) At circuit breaker panel 3-213, hold the W/SHIELD EMERGY DE-ICE switch guard against spring pressure,

cut and remove the locking wire, and allow the guard to rise clear of the switches.

(3) Release the quick-release fasteners securing the circuit breaker panel and lower the panel on its hinges to gain access to the rear of the mounting bracket.

C. Remove Switch

(1) Roll back the rubber terminal cover and disconnect the electrical cables from the switch terminals.

(2) Using a tubular spanner, remove the nut and washer from the front of the mounting bracket and withdraw the switch and tabwasher from the rear.

D. Install Switch

(1) Comply with the electrical safety precautions.

(2) Position the tabwasher on the switch and insert the switch through the aperture from the rear of the mounting bracket, ensuring that the tab on the tabwasher engages the locating hole in the bracket.

(3) Secure the switch to the bracket with the nut and washer, from the front.

(4) Connect the electrical cables to the switch terminals, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(5) Refit the terminal cover over the switch terminals.

E. Conclusion

(1) Close and secure the circuit breaker panel.

(2) Cancel the electrical safety precautions taken before removal, and check the operation of the switch by carrying out the appropriate test procedure.

(3) Ensure that both switches are at OFF. Lower the switch guard and wire-lock it to the lug on the mounting bracket with the fuse wire, in accordance with 20-26-13.

3. Diode

A. Prepare to Remove Diode

(1) Isolate the electrical generation and external power supplies as detailed in 24-00-00, Servicing.

(2) Release the quick-release fasteners securing the circuit breaker panel and lower the panel on its hinges to gain access to the rear of the mounting bracket.

B. Remove Diode

(1) Remove the screw securing the diode board cover to the spacer on the diode board, and remove the cover from the rear of the mounting bracket.

(2) Unsolder the diode wire ends from the barb insulators and remove the diode from the board.

C. Install Diode

(1) Comply with the electrical safety precautions.

(2) Position the replacement diode so that the black ring signifying the cathode end is pointing to terminal 2 on the diode board. Solder the wire ends to the associated barbs in accordance with the Wiring Diagram Manual, 20-42-23.

(3) Refit the diode board cover to the spacer on the diode board and secure it with the screw.

D. Conclusion

(1) Close and secure the circuit breaker panel.

(2) Cancel the electrical safety precautions taken before removal, and check the operation of the diode by carrying out the appropriate test procedure.

FLIGHT COMPARTMENT AND VISOR WINDOW AND WINDSHIELD HEATING - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

BECAUSE OF THE POSSIBILITY OF SHATTERING, D.V. (DIRECT VISION) AND SIDE WINDOWS MUST NOT BE COOLED IN ANY WAY.

ALL PERSONNEL MUST REMAIN CLEAR WHEN VISOR IS OPERATED.

DO NOT LEAVE HEATED GLAZINGS UNATTENDED.

CAUTION: THROUGHOUT THE TESTS D.V. AND SIDE WINDOW TEMPERATURES MUST NOT EXCEED 90 deg C, AND WINDSHIELD AND VISOR WINDOW TEMPERATURES MUST NOT EXCEED 75 deg C. IN HIGH AMBIENT TEMPERATURES THE WINDSHIELDS AND/OR VISOR WINDOWS ONLY MAY BE COOLED BY SPRAYING WITH ICED WATER EVENLY DISTRIBUTED.

1. General

This topic comprises three self-contained tests - an Operational Test, a Functional Test and a System Test.

Throughout the Functional and System Tests, equipment identifications are provided unbracketed for the left system and bracketed for the right system.

The sub-system tests in this topic can be carried out individually or collectively. However, some clarification regarding the use of the related 'Prepare' and 'Conclusion' procedures is necessary. In the Operational Test, which is relatively simple, common 'Prepare' and 'Conclusion' procedures are provided. These need only be carried out once, i.e., before and after the sub-system test or tests.

R The Functional Test and the System Test are somewhat different in that individual 'Prepare' procedures are provided, together with common 'Conclusion' procedures. Therefore each sub-system test must always be preceded by its associated 'Prepare' procedure. The common 'Conclusion' procedures need be carried out only once, i.e., after the sub-system test or tests.

Except for two emergency override switches, which are located on panel 3-213, all the system switches, magnetic indicators and captions referred to in the tests are located on a forward switch panel, which forms part of panel 4-211 in the flight compartment roof.

Operations concerning the visor, emergency generation and weight switch services are included in this topic.

To reduce the time between test operations, and also to obtain accurate readings, all temperature measurements, whether by hand or temperature probe, should be made on the outer face of the glazing.

2. Operational Test

A. Prepare

CAUTION: ENSURE THAT THE VISOR AND FLIGHT COMPARTMENT WINDOWS ARE FREE FROM PROTECTIVE COVERS, ETC.

(1) Ensure that -

(a) both W/SHIELD DE-ICE magnetic indicators display diagonal stripes, signifying 'power off',

(b) all the system switches on panel 4-211 are set to the OFF position, and

(c) the EMERG RELIGHT BUSBAR switch on panel 18-214 is set to the OFF position.

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29.

(4) Observing all relevant safety precautions, unlock and lower the visor (Ref. 27-61-00).

(5) Place a warning notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

NOTE: In the following tests, it is assumed that the glazings, and hence the integral sensors and thermostats, are below the control switching temperature.

B. Test D.V. and Side Window Demisting

(1) Set both system D.V. DEMIST switches to the "ON" position and check by hand or detector probe that the left and right D.V. and side windows heat up. Check also that the associated O/HEAT captions remain extinguished.

(2) Return the D.V. DEMIST switches to the "OFF" position and check that the windows cool down.

C. Test Windshield De-icing

(1) Check that both W/SHIELD EMERGY DE-ICE switches on panel 3-213 are held in the OFF position by the switch-guard, and that the switch-guard is wire-locked to the lug on the mounting bracket with 26 s.w.g. tinned copper wire. If not, ensure that both switches are set to the OFF position, then lower the switch-guard and wire-lock it as detailed in 20-26-13.

(2) Check that both W/SHIELD DE-ICE magnetic indicators display cross-line.

(3) Set both W/SHIELD DE ICE switches to the "LOW" position and check that both W/SHIELD DE-ICE magnetic indicators display in-line. Check also, by hand or temperature probe, that all three heated areas of each windshield are heating up. Reset both W/SHIELD DE ICE switches to the "HIGH" position and check that both W/SHIELD DE-ICE magnetic indicators again display in-line. The associated O/HEAT captions must remain extinguished all the time the switches are set to an 'on' position.

(4) Return both W/SHIELD DE ICE switches to the "OFF" position and check that both W/SHIELD DE-ICE magnetic indicators display cross-line.

D. Test Visor Window De-icing

(1) Set both system VISOR DE ICE switches to the "ON" position and check by hand or detector probe that all the visor windows remain at ambient temperature.

(2) Observing all relevant safety precautions, raise the visor to the up, locked position (Ref. 27-61-00). Check by hand or detector probe that each heated area of all the visor windows heats up and that the associated O/HEAT captions remain extinguished.

(3) Return the VISOR DE ICE switches to the "OFF" position and check that all the visor windows cool down.

E. Conclusion

(1) Remove the warning notice from the centre console.

(2) Depressurize the green hydraulic system and disconnect hydraulic ground power as detailed in Chapter 29.

(3) Switch off and disconnect electrical ground power as detailed in 24-41-00.

3. Functional Test

WARNING: IN THE FOLLOWING TESTS, BACK-UP OVERHEAT CIRCUITS ARE BYPASSED AND THE WINDSHIELDS/WINDOWS ATTAIN THEIR MAXIMUM OVERHEAT TEMPERATURES. ENSURE THAT -

(1) NO ONE TOUCHES THE WINDSHIELDS/WINDOWS UNLESS SPECIFICALLY INSTRUCTED TO DO SO AND

(2) THE APPROPRIATE SYSTEM SWITCH IS RETURNED TO THE 'OFF' POSITION IF THE WINDSHIELD/ WINDOW EXCEEDS THE OVERHEAT CUT-OFF TEMPERATURE.

CAUTION: ENSURE THAT THE VISOR AND FLIGHT COMPARTMENT WINDOWS ARE FREE FROM PROTECTIVE COVERS, ETC.

R NOTE: During the Functional Tests, the operation of each normal and overheat channel is checked independently. Adequate time must be allowed during these procedures for the heating (approximately 30 min for demisting and 8 min for de-icing) and cooling of the glazings, and it should be borne in mind that each test can only be initiated with the glazing, and hence the associated thermostat or sensor, at a temperature below the control switching point.

A. Equipment and Materials

DESCRIPTION	PART NO.
Two multimeters, e.g., Avometer Type 8	-
Thermometer with remote non-metallic probe, e.g., Comark Electronics type 3001 and probe type KASP	-
Throttle control system test set	QT6A15-24

DESCRIPTION	PART NO.
Two resistances, each approximately 470 ohm, e.g., decade resistance boxes	-
~~Circuit breaker safety clips~~	-

B. Prepare to Test D.V. and Side Window Demisting

(1) Ensure that the two D.V. DEMIST switches are set to OFF.

(2) Make available electrical ground power as detailed in 24-41-00.

C. Test D.V. and Side Window Demisting

CAUTION: OBSERVE THE CAUTION AT THE BEGINNING OF THIS TOPIC.

(1) Identify test socket UT1801, panel 13-123 (UT1802, 16-123), then set the left (right) D.V. DEMIST switch to the "ON" position. Check by hand or temperature probe that the appropriate windows are heating up, then check that 28 V d.c. is available at the test socket, pin 1C. Monitor the 28 V and check that it cycles off-on when the heating is cycling about the normal operating temperature.

(2) Return the D.V. DEMIST switch to the "OFF" position, then connect a link between test socket pins 1A and 1C.

(3) Once again set the D.V. DEMIST switch to the "ON" position and monitor the 28 V at test socket pin 1C; check that the supply is available as the windows heat up and cycles off-on when the heating is cycling about the overheat operating temperature.

NOTE: The appropriate O/HEAT caption will cycle on-off as the 28 V cycles off-on.

(4) Return the D.V. DEMIST switch to the "OFF" position.

(5) Remove the link from the left (right) test socket.

D. Prepare to Test Windshield De-icing (Low Power Operation)

(1) Gain access to the left (right) temperature controller by removing the panel covering shelf 10-215 (9-216) of the flight compartment racking.

(2) Ensure that -

(a) both W/SHIELD DE-ICE magnetic indicators display diagonal stripes, signifying 'power off',

(b) the two W/SHIELD DE ICE switches on panel 4-211 are set to the OFF position, and

(c) the EMERG RELIGHT BUSBAR switch on panel 18-214 is set to the OFF position.

(3) Make available electrical ground power as detailed in 24-41-00.

(4) Check that the visor is in the fully down position. If not -

(a) make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29, then,

(b) observing all relevant safety precautions, unlock and lower the visor (Ref. 27-61-00).

(5) Place a warning notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

E. Test Windshield De-icing (Low Power Operation)

CAUTION: OBSERVE THE CAUTION AT THE BEGINNING OF THIS TOPIC.

(1) Set the left (right) W/SHIELD DE ICE switch to the "LOW" position and check that the left (right) W/SHIELD DE-ICE magnetic indicator displays in-line. Check also, by hand or temperature probe, that all three heated areas of the appropriate windshield are heating up. Monitor the magnetic indicator and the associated O/HEAT caption and check that, as the heating cycles about the normal operating temperature, the magnetic indicator cycles cross-line/in-line and the caption remains extinguished.

(2) Return the W/SHIELD DE ICE switch to the "OFF"

R position, then identify the test socket on the front of the temperature controller, equipment identification reference 1H149 (2H149) on shelf 10-215 (9-216) of the flight compartment racking. Using suitable adapters, connect one 470 ohm resistance between test socket pins B and C, and the other between pins q and r.

R (3) Set the left (right) W/SHIELD DE ICE switch to the "LOW" position and check that the left (right) W/SHIELD DE-ICE magnetic indicator displays in-line. Monitor the magnetic indicator and the associated O/HEAT caption and check that, as the heating cycles about the overheat operating temperature, the magnetic indicator cycles cross-line/in-line, with the O/HEAT caption cycling on/off at the same time.

(4) Return the W/SHIELD DE ICE switch to the "OFF" position.

(5) Remove the 470 ohm resistance from test socket pins q and r and connect it between pins W and X.

(6) Repeat operations (3) and (4).

(7) Remove the resistances from the left (right) controller test socket.

F. Prepare to Test Windshield De-icing (High/Low Selection)

(1) Gain access to the left (right) temperature controller by removing the panel covering shelf 10-215 (9-216) of the flight compartment racking.

(2) If the left system is to be tested, gain access to the No.1 engine control amplifier (throttle amplifier) by removing the panel covering shelf 8-215 of the flight compartment racking.

(3) Ensure that all services liable to be adversely affected by the tripping of the weight switch circuit breakers are effectively isolated (Ref. 7-11-00), except for the windshield de-icing systems.

(4) Trip and fit a safety clip to the LH UC WEIGHT SW A SYS SUP circuit breaker G292, panel 1-213, map ref.M17 (RH UC WEIGHT SW B SYS SUP, G294, 3-213, B9).

R (5) Ensure that -

R (a) both W/SHIELD DE-ICE magnetic indicators display

R diagonal stripes, signifying 'power off',

R (b) the two W/SHIELD DE ICE switches on panel 4-211
R are set to the OFF position, and

R (c) the EMERG RELIGHT BUSBAR switch on panel 18-214
R is set to the OFF position.

(6) Make available electrical ground power as detailed in 24-41-00.

(7) Ensure that the visor is in the fully down position. If not -

(a) make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29, then,

(b) observing all relevant safety precautions, unlock and lower the visor (Ref. 27-61-00).

(8) Place a warning notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

NOTE: Operations (9) to (13), inclusive, apply to the left system only, and are required to close the auto-shed breaker (Ref. 24-22-00). Specific settings of the engine throttles and test set switches are not required.

(9) Depressurize the green hydraulic system and disconnect hydraulic ground power as detailed in Chapter 29.

(10) On flight compartment roof panel 4-211, check that the Nos.1 and 2 HP VALVE switches are set to SHUT and that the Nos.1 and 2 AUTO IGNITION and THROTTLE MASTER switches are set to OFF.

(11) Trip and fit a safety clip to the ENG 1 MAIN THROT SUP circuit breaker 1K1, panel 2-213, map ref.F12.

(12) Connect cable 2 of the throttle control system test set between connector PL2 of the test set and connector SKT2 of the No.1 engine control amplifier, equipment identification reference 1K20.

WARNING: THE ENGINES MUST NOT BE RUN OR THE GREEN HYDRAULIC SYSTEM PRESSURIZED WHILE THE THROTTLE CONTROL SYSTEM TEST SET IS CONNECTED TO THE AIRCRAFT SYSTEM.

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(13) Reset the ENG 1 MAIN THROT SUP circuit breaker 1K1, panel 2-213, map ref.F12, and ensure that -

(a) the No.1 engine N2 rpm indicator on the pilots' dashboard centre instrument panel reads approximately 65 per cent, and

(b) the magnetic indicator immediately below the emergency generator FAIL caption, on the lower part of electrical generating control panel 6-214 (the ASB position magnetic indicator, but not marked as such), displays in-line.

G. Test Windshield De-icing (High/Low Selection)

R (1) Set the left (right) W/SHIELD DE ICE switch to the "LOW" position.

(2) Check that when the windshield heating is cycled 'on', low power is applied to the heating elements, i.e., R when the left (right) W/SHIELD DE-ICE magnetic indicator displays in line, 115 V a.c. is available between terminal A2 of relay 1H144 (2H144) and terminal C2 of relay 1H145 (2H145), both on panel 21-123 (23-123) of the underfloor racking.

(3) Set the left (right) W/SHIELD DE ICE switch to the R "HIGH" position and check that the W/SHIELD DE-ICE magnetic indicator again displays in-line.

(4) Repeat operation (2), but instead checking that high power is being applied to the heating elements, i.e., 200 V a.c. is available between the relay terminals.

(5) Return the left (right) W/SHIELD DE ICE switch to the "OFF" position.

R H. Prepare to Test Windshield De-icing (Emergency Override)

R (1) Make available electrical ground power as detailed in 24-41-00.

R (2) Check that the visor is in the fully down position. If not -

R (a) make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29, then,

R (b) observing all relevant safety precautions, unlock and lower the visor (Ref. 27-61-00).

(3) Place a warning notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

(4) Ensure that the two W/SHIELD DE ICE switches, and the EMERG RELIGHT BUSBAR switch on panel 18-214, are set to OFF.

(5) Trip and fit a safety clip to the LH W/SCREEN HTR SUP ~~circuit breaker 1H141, panel 2-213, map ref.E20~~ (RH W/SCREEN HTR SUP, 2H141, panel 14-216, map ref. F11).

WARNING: SUBSEQUENT PROCEDURES REQUIRE THE TESTING OF 200/115 V A.C. CONTROL EQUIPMENT WITH POWER APPLIED AND THE REAR OF A CB PANEL EXPOSED. PLACE A SUITABLE WARNING PLACARD (REF. 11-00-00) IN THE AREA AND ENSURE THAT OTHER PERSONS REMAIN CLEAR UNTIL THE PANEL IS SECURED.

(6) Gain access to the rear of the left (right) W/SHIELD EMERGY DE-ICE switch by supporting circuit breaker panel 3-213 and releasing the quick-release fasteners securing it to the aircraft structure, then allowing the panel to hang down on its restraining cord. Pull back the rubber boot to expose the switch terminals.

I. Test Windshield De-icing (Emergency Override)

CAUTION: OBSERVE THE CAUTION AT THE BEGINNING OF THIS
R TOPIC.

(1) Reset circuit breaker 1H141 (2H141), then set the left (right) W/SHIELD DE ICE switch to the "LOW" position. With the left (right) W/SHIELD DE-ICE magnetic indicator cycled in-line, check that -

(a) 115 V a.c. is available between terminals 2
R and 5 of the W/SHIELD EMERGY DE-ICE switch,

(b) the associated O/HEAT caption remains extinguished, and

(c) all three heated areas of the left (right) windshield heat up.

R CAUTION: AFTER THE FOLLOWING OPERATION (2) THE "W/SHIELD
R EMERGY DE-ICE" SWITCHES MUST BE RETURNED TO
R "OFF" AS SOON AS POSSIBLE, BECAUSE THE EMERGENCY
R HEATING DOES NOT INCLUDE OVERHEAT PROTECTION.

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(2) Wait until the magnetic indicator cycles cross-line, then set the guarded left (right) W/SHIELD EMERGY DE-ICE switch to the "ON" position and check that the 115 V at the switch terminals has been replaced by 200 V a.c. Check also that the O/HEAT caption is illuminated steadily.

(3) Return the W/SHIELD EMERGY DE-ICE and W/SHIELD DE ICE switches to the "OFF" position, then trip and fit a safety clip to circuit breaker 1H141 (2H141) (Ref. para. H.(5)).

J. Prepare to Test Main (Flat) Visor Window De-icing

(1) Trip and fit safety clips to the following LH (RH) circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH CURVED VISOR HTR SUP	14-215	1H223	G8
LH BOTTOM VISOR HTR SUP	14-215	1H225	E9
RH CURVED VISOR HTR SUP	13-216	2H223	G10
RH BOTTOM VISOR HTR SUP	13-216	2H225	B10

(2) Gain access to the left (right) temperature controller by removing the panel covering shelf 10-215 (9-216) of the flight compartment racking.

(3) Make available electrical ground power as detailed in 24-41-00.

(4) Ensure that the two VISOR DE ICE switches are set to OFF.

(5) Ensure that the visor is in the up, locked position. If not -

(a) make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29, then,

(b) observing all relevant safety precautions, raise

the visor to the up, locked position (Ref. 27-61-00).

(6) Place a warning notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

K. Test Main (Flat) Visor Window De-icing

CAUTION: OBSERVE THE CAUTION AT THE BEGINNING OF THIS TOPIC.

(1) Identify the test socket on the front of the temperature controller, equipment identification reference 1H149 (2H149), on shelf 10-215 (9-216) of the flight compartment racking, then set the left (right) VISOR DE ICE switch to the "ON" position. Check by hand or temperature probe that all three heated areas of the appropriate main (flat) window are heating up, then check that 28 V d.c. is available at the test socket, pin j. Monitor the 28 V and check that it cycles off-on when the heating is cycling about the normal operating temperature.

R (2) Return the VISOR DE ICE switch to the "OFF" position; then, using suitable adapters, connect one 470 ohm resistance between test socket pins c and t, and the other between pins b and G.

(3) Set the left (right) VISOR DE ICE switch to the "ON" position. Check that 28 V d.c. is available at the test socket, pin n, and that it cycles off-on when the heating is cycling about the overheat operating temperature.

NOTE: The appropriate O/HEAT caption will cycle on-off as the 28 V cycles off-on.

(4) Return the VISOR DE ICE switch to the "OFF" position.

(5) Disconnect the 470 ohm resistance from test socket pin b and connect it to pin F.

(6) Repeat operations (3) and (4).

(7) Remove the resistances from the left (right) controller test socket.

L. Prepare to Test Curved Visor Window De-icing

(1) Trip and fit safety clips to the following LH (RH) circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH FLAT VISOR HTR SUP	14-215	1H221	G5
LH BOTTOM VISOR HTR SUP	14-215	1H225	E9
RH FLAT VISOR HTR SUP	13-216	2H221	G13
RH BOTTOM VISOR HTR SUP	13-216	2H225	B10

(2) Gain access to the left (right) temperature controller by removing the panel covering shelf 10-215 (9-216) of the flight compartment racking.

(3) Make available electrical ground power as detailed in 24-41-00.

(4) Ensure that the two VISOR DE ICE switches are set to OFF.

(5) Ensure that the visor is in the up, locked position. If not -

(a) make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29, then,

(b) observing all relevant safety precautions, raise the visor to the up, locked position (Ref. 27-61-00).

(6) Place a warning notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

M. Test Curved Visor Window De-icing

CAUTION: OBSERVE THE CAUTION AT THE BEGINNING OF THIS TOPIC.

(1) Identify the test socket on the front of the temperature controller, equipment identification reference 1H149 (2H149), on shelf 10-215 (9-216)

of the flight compartment racking, then set the left (right) VISOR DE ICE switch to the "ON" position. Check by hand or temperature probe that all three heated areas of the appropriate curved window are heating up, then check that 28 V d.c. is available at the test socket, pin P. Monitor the 28 V and check that it cycles off-on when the heating is cycling about the normal operating temperature.

(2) Return the VISOR DE ICE switch to the "OFF" position then, using suitable adapters, connect one 470 ohm resistance between test socket pins a and Z, and the other between pins D and E.

(3) Set the left (right) VISOR DE ICE switch to the "ON" position. Check that 28 V d.c. is available at the test socket, pin T, and that it cycles off-on when the heating is cycling about the overheat operating temperature.

NOTE: The appropriate O/HEAT caption will cycle on-off as the 28 V cycles off-on.

(4) Return the VISOR DE ICE switch to the "OFF" position.

(5) Disconnect the 470 ohm resistance from test socket pin E and connect it to pin Y.

(6) Repeat operations (3) and (4).

(7) Remove the resistances from the left (right) controller test socket.

N. Prepare to Test Detachable Visor Window De-icing

(1) Trip and fit safety clips to the following LH (RH) circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH FLAT VISOR HTR SUP	14-215	1H221	G5
LH CURVED VISOR HTR SUP	14-215	1H223	G8
RH FLAT VISOR HTR SUP	13-216	2H221	G13
RH CURVED VISOR HTR SUP	13-216	2H223	G10

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.

(2) Gain access to the left (right) temperature controller by removing the panel covering shelf 10-215 (9-216) of the flight compartment racking.

(3) Make available electrical ground power as detailed in 24-41-00.

(4) Ensure that the two VISOR DE ICE switches are set to OFF.

(5) Ensure that the visor is in the up, locked position. If not -

(a) make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29, then,

(b) observing all relevant safety precautions, raise the visor to the up, locked position (Ref. 27-61-00).

(6) Place a warning notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

P. Test Detachable Visor Window De-icing

CAUTION: OBSERVE THE CAUTION AT THE BEGINNING OF THIS TOPIC.

(1) Identify the test socket on the front of the temperature controller, equipment identification reference 1H149 (2H149), on shelf 10-215 (9-216) of the flight compartment racking, then set the left (right) VISOR DE ICE switch to the "ON" position. Check by hand or temperature probe that the appropriate detachable window is heating up, then check that 28 V d.c. is available at the test socket, pin R. Monitor the 28 V and check that it cycles off-on when the heating is cycling about the normal operating temperature.

(2) Return the VISOR DE ICE switch to the "OFF" position and, using suitable adapters, connect a 470 ohm

resistance between test socket pins BB and GG.

(3) Set the left (right) VISOR DE ICE switch to the "ON" position. Check that 28 V d.c. is available at the test socket, pin U, and that it cycles off-on when the heating is cycling about the overheat operating temperature.

NOTE: The appropriate O/HEAT caption will cycle on-off as the 28 V cycles off-on.

(4) Return the VISOR DE ICE switch to the "OFF" position.

(5) Remove the resistance from the left (right) controller test socket.

Q. Conclusion

WARNING: ALL LINKS AND/OR RESISTANCES USED IN THE TESTS MUST BE REMOVED FROM THE TEST SOCKETS.

(1) If the visor was operated during the tests, depressurize the green hydraulic system and disconnect hydraulic ground power as detailed in Chapter 29.

(2) If the throttle control system test set is fitted, trip the ENG 1 MAIN THROT SUP circuit breaker 1K1, panel 2-213, map ref.F12, disconnect the test set cable from the engine control amplifier and reset circuit breaker 1K1.

(3) If tripped, reset the LH UC WEIGHT SW A SYS SUP circuit breaker G292, panel 1-213, map ref.M17 (RH UC WEIGHT SW B SYS SUP, G294, 3-213, B9), then reinstate the associated services (Ref. 7-11-00).

(4) If a W/SHIELD EMERGY DE-ICE switch has been tested, refit the protective boot to the switch terminals and raise and secure panel 3-213. Finally, ensure that both switches are in the OFF position, then lower the switch-guard and wire-lock it to the lug on the mounting bracket with 26 s.w.g. tinned copper wire, as detailed in 20-26-13.

(5) Reset any system circuit breakers tripped during the tests.

(6) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(7) Refit any panels removed from the flight compartment

racking.

(8) Remove all warning notices and test equipment from the aircraft.

4. System Test

A. Equipment and Materials

DESCRIPTION	PART NO.
Locally made test unit and test looms *	-
Thermometer with remote non-metallic probe, e.g., Comark Electronics type 3001 and probe type KASP	-
Two suitable multimeters (e.g., Avometer type 8)	-
Resistance meter	Croydon Precision Instruments Type PW2, or equivalent
Circuit breaker safety clips	-
Torque spanner, 12 to 14 lbf in (0.137 to 0.160 mdaN)	ULTRA-WB808-6UNC

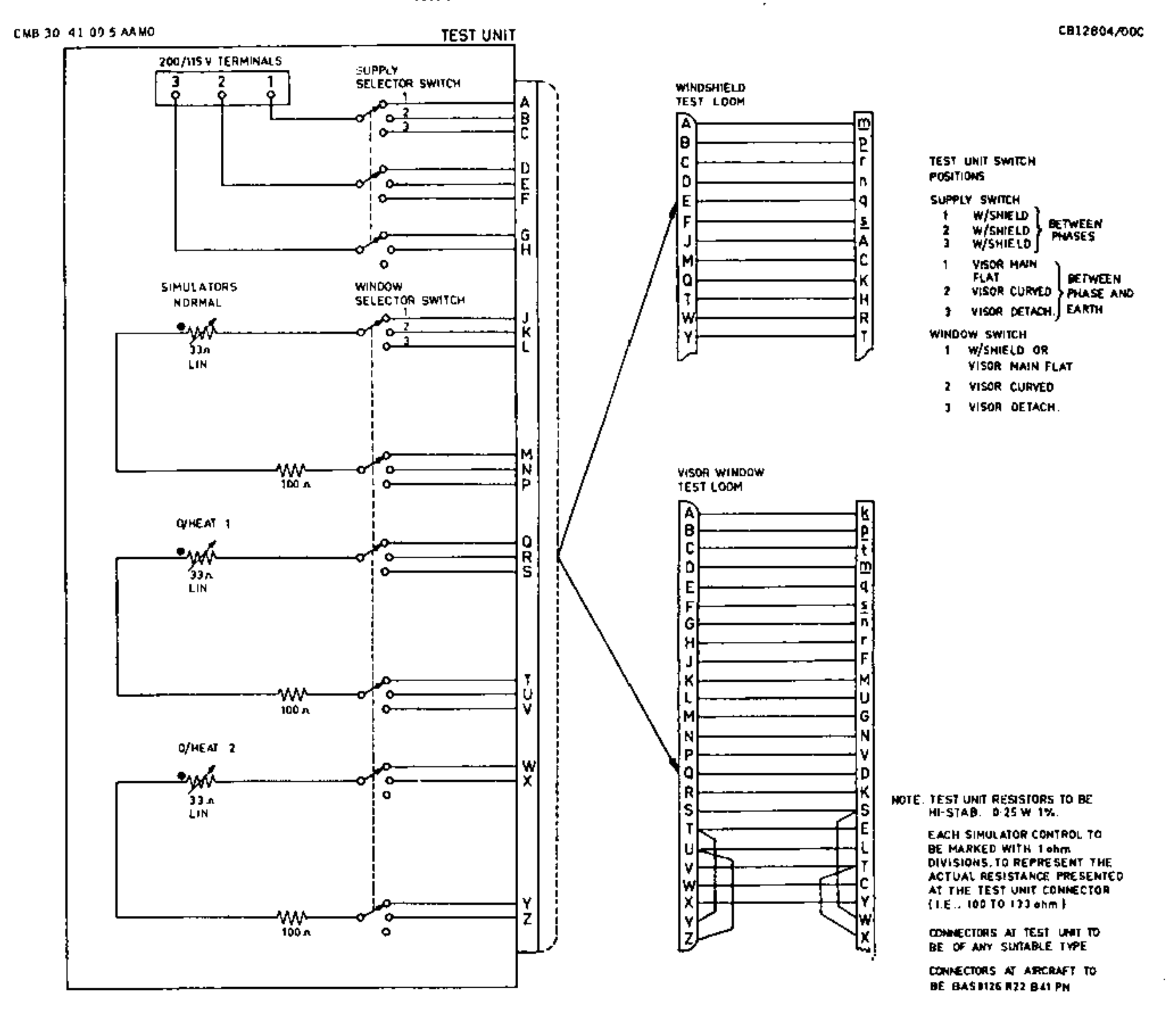
* (Ref. Fig. 501)

CAUTION: ENSURE THAT THE WINDSHIELDS AND WINDOWS ARE FREE FROM PROTECTIVE COVERS, ETC.

B. Prepare to Test D.V. and Side Window Demisting

(1) Ensure that both system D.V. DEMIST switches are at the OFF position.

(2) Trip and fit safety clips to the appropriate left or right system circuit breakers listed below.



R Test Unit and Test Looms
Figure 501

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH DV WINDOW HTR SUP	14-215	1H181	D9
LH DV WINDOW HTR CONT	15-215	1H182	C10
RH DV WINDOW HTR SUP	13-216	2H181	C10
RH DV WINDOW HTR CONT	15-216	2H182	C14

(3) Make available electrical ground power as detailed in 24-41-00.

C. Test D.V. and Side Window Demisting

(1) Remove the insulating covers from the left (right) D.V. and side windows to gain access to the appropriate module block and terminal block (Ref. 25-12-00).

(2) Disconnect the cables listed in Table 501 from the window side of the module and terminal blocks; measure the resistance between the cables in each pair, with the windows cold, and check that the resistances are as tabulated.

MODULE/TERMINAL BLOCK IDENT.	TERMINAL NOS.	CABLE COLOUR/IDENT.	RESISTANCE RANGE (ohm)
Left D.V. window			
1H190	1 and 4	Red/01 and Orange/02	28.8 to 35.2
1H190	2 and 3	White/03 and Brown/04	0 (continuity)
Right D.V. window			
2H190	1 and 5	Red/01 and Orange/02	28.8 to 35.2
2H190	2 and 4	White/03 and	0 (continuity)

MODULE/TERMINAL BLOCK IDENT.	TERMINAL NOS.	CABLE COLOUR/IDENT.	RESISTANCE RANGE (ohm)
		Brown/04	
Left side window			
UG2102	1 and 5	Orange and Red	39.1 to 47.7
UG2102	2 and 3	White and Brown	0 (continuity)
Right side window			
UG2101	1 and 5	Orange and Red	39.1 to 47.7
UG2101	2 and 3	White and Brown	0 (continuity)

D.V. and Side Window Demisting - Elements and Thermostats
Table 501

(3) Reset circuit breaker 1H182 (2H182) (Ref. para.B.(2)).

(4) Set the left (right) D.V. DEMIST switch to the "ON" position and check that the associated O/HEAT caption is illuminated, then return the switch to the "OFF" position.

(5) Trip and fit a safety clip to circuit breaker 1H182 (2H182) (Ref. para.B.(2)).

(6) With the exception of the red cables, reconnect the cables to the module block and the terminal block, ensuring that the connections are made in accordance with the cable identification and the applicable wiring diagram; torque-tighten terminal nuts to between 12 and 14 lbf in (0.137 and 0.160 mdaN).

(7) Using suitable adapters, connect multimeters, set to a nominal range of from 0 to 5 A a.c., between each red cable and its associated termination.

(8) Reset circuit breakers 1H181 and 1H182 (2H181 and 2H182) (Ref. para.B.(2)).

NOTE: In the following two operations the switching points of the thermostat integral with each D.V. window are determined by observing the associated multimeter.

(9) Set the left (right) D.V. DEMIST switch to the "ON" position and check that each multimeter indicates a load current. The associated O/HEAT caption must remain extinguished.

(10) Using the detector probe, monitor the temperature of the D.V. window in the region of the thermostat, and check that the demisting is cycled between +40(±8) and +55(±8) deg C. Check also that the associated O/HEAT caption remains extinguished.

(11) Return the left (right) D.V. DEMIST switch to the "OFF" position and check that the heating ceases, i.e., the multimeters indicate zero current flow and the D.V. and side windows cool down.

(12) Trip and fit safety clips to circuit breakers 1H181 and 1H182 (2H181 and 2H182) (Ref. para.B.(2)).

(13) Disconnect and remove the multimeters, then reconnect the red cables to the module block and the terminal block, ensuring that the connections are made in accordance with the cable identification and the applicable wiring diagram; torque-tighten the remaining terminal nut to between 12 and 14 lbf in (0.137 and 0.160 mdaN).

(14) Refit the insulating covers to the D.V. and side windows (Ref. 25-12-00).

(15) Reset circuit breakers 1H181 and 1H182 (2H181 and 2H182) (Ref. para.B.(2)).

(16) Set the left (right) D.V. DEMIST switch to the "ON" position and check by hand or detector probe that the left (right) D.V. and side windows heat up. Check also that the associated O/HEAT caption remains extinguished.

(17) Return the D.V. DEMIST switch to the "OFF" position and check that the windows cool down.

D. Prepare to Test Windshield De-icing

(1) Ensure that the weight of the aircraft is on the landing gear, i.e., weight switches operated.

(2) Trip and fit safety clips to the appropriate left or right system circuit breakers list below.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH W/SCREEN HTR CONT	1-213	1H142	J9
LH W/SCREEN HTR SUP	2-213	1H141	E20
RH W/SCREEN HTR SUP	14-216	2H141	F11
RH W/SCREEN HTR CONT	15-216	2H142	B17

(3) If the left system is to be tested, gain access to the No.1 engine control amplifier (throttle amplifier) by removing the panel covering shelf 8-215 of the flight compartment racking.

(4) Ensure that all services liable to be adversely affected by the tripping of the weight switch circuit breakers are effectively isolated (Ref. 7-11-00), except for the windshield de-icing systems.

(5) Ensure that -

(a) both W/SHIELD DE-ICE magnetic indicators display diagonal stripes, signifying 'power off',

(b) both W/SHIELD DE-ICE switches on panel 4-211 are set to OFF, and

(c) the EMERG RELIGHT BUSBAR switch on panel 18-214 is set to OFF.

(6) Make available electrical ground power as detailed in 24-41-00.

(7) Ensure that the visor is in the fully down position. If not -

(a) make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29, then,

(b) observing all relevant safety precautions, unlock and lower the visor (Ref. 27-61-00).

(8) Place a warning notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

NOTE: Operations (9) to (13), inclusive, apply to the left system only, and are required to close the auto-shed breaker (Ref. 24-22-00). Specific settings of the engine throttles and test set switches are not required.

(9) Depressurize the green hydraulic system and disconnect hydraulic ground power as detailed in Chapter 29.

(10) On flight compartment roof panel 4-211, check that the Nos.1 and 2 HP VALVE switches are set to SHUT and that the Nos.1 and 2 AUTO IGNITION and THROTTLE MASTER switches are set to OFF.

(11) Trip and fit a safety clip to the ENG 1 MAIN THROT SUP circuit breaker 1K1, panel 2-213, map ref.F12.

(12) Connect cable 2 of the throttle control system test set between connector PL2 of the test set and connector SKT2 of the No.1 engine control amplifier, equipment identification reference 1K20.

WARNING: THE ENGINES MUST NOT BE RUN OR THE GREEN HYDRAULIC SYSTEM PRESSURIZED WHILE THE THROTTLE CONTROL SYSTEM TEST SET IS CONNECTED TO THE AIRCRAFT SYSTEM.

(13) Reset the ENG 1 MAIN THROT SUP circuit breaker 1K1, panel 2-213, map ref.F12, and ensure that -

(a) the No.1 engine N2 rpm indicator on the pilots' dashboard centre instrument panel reads approximately 65 per cent, and

(b) the magnetic indicator immediately below the emergency generator FAIL caption, on the lower part of electrical generating control panel 6-214 (the ASB position magnetic indicator, but not marked as such), reads in-line.

E. Test Windshield De-icing

(1) Disconnect connector 1H146-A (2H146-A) from the bottom outboard corner of the windshield.

(2) With the windshield cold, use a resistance meter and suitable adapter to check the resistance of the windshield elements at the windshield connector; resistances must be within the specified range.

ELEMENT	PINS	RESISTANCE RANGE (ohm)
Heating (A-phase)	n to m	26.73 to 32.67
Heating (B-phase)	q to p	27.99 to 34.21
Heating (C-phase)	s to r	32.04 to 39.16
Sensing (normal)	A to C	99.25 to 100.75
Sensing (o/heat 1)	K to H	99.25 to 100.75
Sensing (o/heat 2)	R to T	99.25 to 100.75
Sensing (normal spare)	D to F	99.25 to 100.75
Sensing (o/heat 1 spare)	L to N	99.25 to 100.75
Sensing (o/heat 2 spare)	X to V	99.25 to 100.75

Windshield De-icing Elements
Table 502

NOTE: The resistance values quoted for the sensing elements assume a windshield temperature of +20 deg C. Therefore corrections must be made to the values when different temperatures are encountered; add or subtract 0.6 ohm/deg rise or fall in temperature respectively.

(3) Connect the test unit to aircraft connector 1H146-A (2H146-A), using the windshield test loom.

(4) Connect a multimeter, set to a nominal range of at least 0 to 250 V a.c., between test unit terminals 1 and 2.

(5) On the test unit, set the selector switches to the "1" position and the simulators to the fully counter-clockwise, i.e., 100 ohm, position.

(6) Reset system circuit breakers 1H141 and 1H142 (2H141 and 2H142) (Ref. para.D.(2)).

(7) Trip and fit a safety clip to LH UC WEIGHT SW A SYS SUP circuit breaker G292, panel 1-213, map ref.K17 (RH UC WEIGHT SW B SYS SUP, G294, panel 3-213, map ref.B9).

(8) Set the left (right) W/SHIELD DE ICE switch to the "HIGH" position and check that the multimeter indicates a nominal 200 V a.c.

(9) Set the test unit SUPPLY selector switch to the "2" and "3" positions in turn and check that the multimeter indicates 200 V a.c. in each position.

(10) Trip VISOR SERVICES A SYS CONT circuit breaker M14 panel 1-213, map ref.Q18. Check that the multimeter indicates a nominal 115 V a.c.

(11) Set the test unit SUPPLY selector switch to the "2" and "1" positions in turn and check that the multimeter indicates 115 V a.c. in each position.

(12) Reset VISOR SERVICES A SYS CONT circuit breaker M14 and check that the multimeter indicates 200 V a.c.

(13) Reset then trip LH UC WEIGHT SW A SYS SUP circuit breaker G292 (RH UC WEIGHT SW B SYS SUP, G294). Check that the multimeter first indicates 115 V a.c., then 200 V a.c.

NOTE: The following two operations are applicable only to the left system.

(14) Trip then reset No.2 & 3 EMER RELT BUS SELECT SUP circuit breaker 1X230, panel 1-213, map ref.R10. Check that the multimeter first indicates 115 V a.c., then 200 V a.c.

(15) Set the EMERG RELIGHT BUSBAR switch on panel 18-214 to the "2", "4", "3" and "1" positions in turn and check that the left W/SHIELD DE-ICE magnetic indicator displays diagonal stripes and the multimeter indicates 0 V, at each setting, then return the switch to the "OFF" position and check that the multimeter indicates 200 V a.c.

(16) Set the left (right) W/SHIELD DE ICE switch to the "LOW" position and check that the multimeter indicates 115 V a.c.

(17) Set the guarded left (right) W/SHIELD EMERGY DE-ICE switch on panel 3-213 to the "ON" position and check that the associated O/HEAT caption is illuminated.

(18) Ensure that the multimeter still indicates 115 V a.c., then set the test unit SUPPLY selector switch to the "2" position and check that the multimeter indicates 200 V a.c.

(19) Return the W/SHIELD EMERGY DE-ICE switch to the "OFF" position, then check that the O/HEAT caption has been extinguished and the multimeter indicates 115 V a.c.

R (20) Slowly alter the setting of the test unit NORMAL simulator to the 114 ohm position, then check that the multimeter indicates 0 V and the W/SHIELD DE-ICE magnetic indicator displays cross-line.

(21) Set the test unit SUPPLY selector switch to the "1" and "3" positions in turn, and check that the multimeter indicates 0 V in each position.

R (22) Slowly alter the setting of the test unit NORMAL simulator to the 108 ohm position. Check that the multimeter indicates 115 V a.c. and the W/SHIELD DE-ICE magnetic indicator displays in-line, then return the NORMAL simulator to the fully counter-clockwise position.

R (23) Slowly alter the setting of the test unit O/HEAT 1 simulator to the 126 ohm position. Check that the W/SHIELD DE-ICE magnetic indicator displays cross-line, the associated O/HEAT caption is illuminated and the multimeter indicates 0 V.

(24) Set the test unit SUPPLY selector switch to the "2" and "1" positions in turn, and check that the multimeter indicates 0 V in each position.

R (25) Slowly alter the setting of the test unit O/HEAT 1 simulator to the 120 ohm position. Check that the W/SHIELD DE-ICE magnetic indicator displays in-line, the O/HEAT caption is extinguished and the multimeter indicates 115 V a.c.

(26) Return the O/HEAT 1 simulator to the fully counter-clockwise position.

(27) Repeat operations (25) and (26), but using instead the test unit O/HEAT 2 simulator.

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(28) Trip and fit safety clips to circuit breakers 1H141 and 1H142 (2H141 and 2H142) (Ref. para.D.(2)). Check that the multimeter indicates 0 V.

(29) Return the W/SHIELD DE ICE switch to the "OFF" position.

(30) Reset LH UC WEIGHT SW A SYS SUP circuit breaker G292 (RH UC WEIGHT SW B SYS SUP, G294), then reinstate the associated services.

(31) Disconnect and remove the test unit, test loom and multimeter, then reconnect connector 1H146-A (2H146-A) to the windshield connector, first ensuring that the mating surfaces are clean and undamaged.

(32) Reset circuit breakers 1H141 and 1H142 (2H141 and 2H142) (Ref. para.D.(2)).

(33) First set the left (right) W/SHIELD DE ICE switch to the "LOW" position and check by hand or detector probe that all three heated areas of the left (right) windshield are heating up, then set the switch to the "HIGH" position and check that the left (right) W/SHIELD DE-ICE magnetic indicator displays in-line. Throughout the test the associated O/HEAT caption must remain extinguished.

(34) Return the W/SHIELD DE ICE switch to the "OFF" position and check that the windshield cools down.

F. Prepare to Test Visor Window De-icing

(1) Ensure that both system VISOR DE ICE switches are set to the "OFF" position.

(2) Trip and fit safety clips to the appropriate left or right system circuit breakers listed below.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH BOTTOM VISOR HTR SUP	14-215	1H225	E9
LH FLAT VISOR HTR SUP	14-215	1H221	G5
LH CURVED VISOR HTR SUP	14-215	1H223	G8
LH FLAT VISOR HTR CONT	15-215	1H222	C11

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH BOTTOM & CURVED VISOR HTR CONT	15-215	1H224	C12
RH BOTTOM VISOR HTR SUP	13-216	2H225	B10
RH CURVED VISOR HTR SUP	13-216	2H223	G10
RH FLAT VISOR HTR SUP	13-216	2H221	G13
RH FLAT VISOR HTR CONT	15-216	2H222	C15
RH BOTTOM & CURVED VISOR HTR CONT	15-216	2H224	C16

(3) Make available electrical ground power as detailed in 24-41-00.

(4) Check that the visor is in the fully down position. If not -

(a) make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29, then,

(b) observing all relevant safety precautions, unlock and lower the visor (Ref. 27-61-00).

(5) Place a notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

NOTE: Some form of lighting will be required in the droop nose. This can be provided either by flash-free torches or the built-in ground service lights. If required, the ground service lights can be switched on by setting the GRD LIGHTING switch, on panel 20-215 in the flight compartment, to "ON".

G. Test Visor Window De-icing

(1) Gain access to the droop nose through panel 113 BB, as detailed in 27-61-00, Servicing.

(2) Locate plug-break U1035 (U1036) on the visor 'A' frame and disconnect the connectors.

(3) With the windows cold, use a resistance meter and suitable adapter to check the resistance of each element in turn at window connector U1035-A (U1036-A). Resistance must be within the specified range.

ELEMENT	PINS	RESISTANCE RANGE (ohm)
Main (flat) window		
Heating	m to n	41.58 to 50.82
Heating	n to k	41.58 to 50.82
Heating	k to m	41.58 to 50.82
R Discharge	n to earth	nominal 47 kohm
Sensing (normal)	F to G	99.25 to 100.75
Sensing (o/heat 1)	D to E	99.25 to 100.75
Sensing (o/heat 2)	C to D	99.25 to 100.75
Sensing (normal spare)	G to J	99.25 to 100.75
Sensing (o/heat 1 spare)	D to H	99.25 to 100.75
Sensing (o/heat 2 spare)	B to D	99.25 to 100.75
Curved window		
Heating	q to p	31.50 to 38.50
Heating	r to p	31.50 to 38.50
Heating	r to q	31.50 to 38.50
Discharge	r to earth	nominal 50 kohm
Sensing (normal)	M to N	99.25 to 100.75
Sensing (o/heat 1)	K to L	99.25 to 100.75

ELEMENT	PINS	RESISTANCE RANGE (ohm)
Sensing (o/heat 2)	K to Y	99.25 to 100.75
Sensing (normal spare)	N to R	99.25 to 100.75
Sensing (o/heat 1 spare)	K to P	99.25 to 100.75
Sensing (o/heat 2 spare)	K to b	99.25 to 100.75
Detachable window		
Heating	s to t	20.88 to 25.52
Sensing (normal)	U to V	99.25 to 100.75
Sensing (o/heat)	S to T	99.25 to 100.75
Sensing (normal spare)	V to W	99.25 to 100.75
Sensing (o/heat spare)	S to X	99.25 to 100.75

Visor Window De-icing Elements
Table 503

NOTE: The resistance values quoted for the sensing elements assume a window temperature of +20 deg C. Therefore corrections must be made to the values when different temperatures are encountered; add or subtract 0.6 ohm/deg rise or fall in temperature respectively.

(4) Connect the test unit to aircraft connector U1035-B (U1036-B), at the visor 'A' frame, using the visor window test loom.

(5) Connect two multimeters, set to a nominal range of at least 0 to 250 V a.c., to the test unit terminals, one connected between terminals 1 and 2, the other between terminals 2 and 3.

(6) On the test unit, set the selector switches to the "1" position and the simulators to the fully counter-clockwise, i.e., 100 ohm, position.

(7) Trip and fit a safety clip to VISOR SERVICES A SYS CONT circuit breaker M14, panel 1-213, map ref.Q18.

(8) Reset circuit breaker 1H222 (2H222) (Ref. para.F.(2)) then set the left (right) VISOR DE ICE switch to the "ON" position; check that the multimeters indicate 0 V.

(9) Reset circuit breaker 1H221 (2H221) (Ref. para.F.(2)) and check that the multimeters indicate a nominal 200 V a.c.

(10) Reset then trip VISOR SERVICES A SYS CONT circuit breaker M14. Check that the multimeters first indicate 0 V, then 200 V a.c.

(11) Slowly alter the setting of the test unit NORMAL
R simulator, first to the 113 ohm and then to the 107 ohm position. Check that the multimeters first indicate 0 V, then 200 V a.c.

(12) Return the NORMAL simulator to the fully counter-clockwise position.

(13) Slowly alter the setting of the test unit O/HEAT 1
R simulator, first to the 125 ohm and then to the
R 119 ohm position. Check that -

(a) the associated O/HEAT caption is first illuminated and then extinguished, and

(b) the multimeters first indicate 0 V, then 200 V a.c.

(14) Return the O/HEAT 1 simulator to the fully counter-clockwise position.

(15) Repeat operations (13) and (14), but using instead the test unit O/HEAT 2 simulator.

(16) Return the VISOR DE ICE switch to the "OFF" position and check that the multimeters indicate 0 V.

(17) Trip and fit a safety clip to circuit breaker 1H221 (2H221) (Ref. para.F.(2)).

(18) Set the test unit selector switches to the "2" position.

(19) Reset circuit breaker 1H224 (2H224) (Ref. para.F.(2)) then set the left (right) VISOR DE ICE switch to the

"ON" position; check that the multimeters indicate 0 V.

(20) Reset circuit breaker 1H223 (2H223) (Ref. para.F.(2)) and check that the multimeters indicate a nominal 200 V a.c.

(21) Reset then trip VISOR SERVICES A SYS CONT circuit breaker M14. Check that the multimeters first indicate 0 V, then 200 V a.c.

(22) Slowly alter the setting of the test unit NORMAL
R simulator, first to the 113 ohm and then to the
107 ohm position. Check that the multimeters first indicate 0 V, then 200 V a.c.

(23) Return the NORMAL simulator to the fully counter-clockwise position.

R (24) Slowly alter the setting of the test unit O/HEAT 1
R simulator, first to the 125 ohm and then to the
R 119 ohm position. Check that -

(a) the associated O/HEAT caption is first illuminated and then extinguished, and

(b) the multimeters first indicate 0 V, then 200 V a.c.

(25) Return the O/HEAT 1 simulator to the fully counter-clockwise position.

(26) Repeat operations (24) and (25), but using instead the test unit O/HEAT 2 simulator.

(27) Return the VISOR DE ICE switch to the "OFF" position and check that the multimeters indicate 0 V.

(28) Trip and fit a safety clip to circuit breaker 1H223 (2H223) (Ref. para.F.(2)).

(29) Set the test unit selector switches to the "3" position.

NOTE: For the purposes of the following tests, disregard the multimeter connected between test unit terminals 2 and 3.

R Because of differences in the aircraft wiring, the
R NORMAL and O/HEAT 1 simulators are transposed for
R the following right-hand circuit.

(30) Set the left (right) VISOR DE ICE switch to the "ON" position; check that the multimeter indicates 0 V.

(31) Reset circuit breaker 1H225 (2H225) (Ref. para.F.(2)) and check that the multimeter indicates a nominal 115 V a.c.

(32) Reset then trip VISOR SERVICES A SYS CONT circuit breaker M14. Check that the multimeter first indicates 0 V, then 115 V a.c.

R (33) Slowly alter the setting of the test unit NORMAL (O/HEAT 1) simulator, first to the 113 ohm and then to the 107 ohm position. Check that the multimeter first indicates 0 V, then 115 V a.c.

R (34) Return the NORMAL (O/HEAT 1) simulator to the fully counter-clockwise position.

R R (35) Slowly alter the setting of the test unit O/HEAT 1 (NORMAL) simulator, first to the 125 ohm and then to the 119 ohm position. Check that -

(a) the associated O/HEAT caption is first illuminated and then extinguished, and

(b) the multimeter first indicates 0 V, then 115 V a.c.

R (36) Return the O/HEAT 1 (NORMAL) simulator to the fully counter-clockwise position.

(37) Return the VISOR DE ICE switch to the "OFF" position and check that the multimeter indicates 0 V.

(38) Trip and fit a safety clip to circuit breaker 1H225 (2H225) (Ref. para.F.(2)).

(39) Disconnect and remove the test unit, test loom and multimeters.

(40) Reconnect plug break U1035 (U1036), first ensuring that the mating surfaces are clean and undamaged.

(41) Reset circuit breakers 1H221, 1H223 and 1H225 (2H221, 2H223 and 2H225) (Ref. para.F.(2)).

(42) Reset VISOR SERVICES A SYS CONT circuit breaker M14.

(43) Set the left (right) VISOR DE ICE switch to the "ON"

position and check by hand or detector probe that all the left (right) visor windows are not being heated.

(44) Remove the visor locks and, observing all relevant safety precautions, raise the visor to the up, locked, position (Ref. 27-61-00, Servicing). Check by hand or detector probe that each heated area of all the left (right) visor windows heats up, and that the associated O/HEAT caption remains extinguished.

(45) Return the VISOR DE ICE switch to the "OFF" position and check that all the left (right) visor windows cool down.

(46) Remove all tools and equipment from the droop nose.

(47) Ensure that all locks are removed from the nose and visor, then refit access panel 113 BB (Ref. 27-61-00, Servicing).

H. Conclusion

(1) If the visor was operated during the tests, depressurize the green hydraulic system and disconnect hydraulic ground power as detailed in Chapter 29.

(2) If the ground service lights in the droop nose have been utilized, return the GRD LIGHTING switch, on panel 20-215 in the flight compartment, to the OFF position.

(3) If the throttle control system test set is fitted, trip the ENG 1 MAIN THROT SUP circuit breaker 1K1, panel 2-213, map ref.F12, disconnect the test set cable from the engine control amplifier and reset circuit breaker 1K1.

(4) If a W/SHIELD EMERGY DE-ICE switch has been operated, ensure that both switches are in the "OFF" position, then lower the switch-guard and wire-lock it to the lug on the mounting bracket with 26 s.w.g. tinned copper wire, as detailed in 20-26-13.

(5) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(6) Refit any panels removed from the flight compartment racking.

(7) Remove all warning notices and test equipment from the aircraft.

FLIGHT COMPARTMENT AND VISOR WINDOW AND WINDSHIELD HEATING - APPROVED REPAIRS

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

In the following procedures, faulty thermostats in the D.V. and side window demisting circuits are electrically disconnected, and in-built spare thermostats are connected in their place.

Similarly, faulty sensors in the windshield de-icing and visor window de-icing circuits are disconnected, and in-built spare sensors are connected in their place.

R In the event of total failure of a visor window heating system
R (no control possible in at least two phases), it is permissible
R to leave certain windows unheated with their circuit breakers
R tripped (Ref. Table 1), until a suitable occasion arises for
R replacement. To retain heating control with various combin-
R ations of sensors failed, sensor connections can be rearranged
R and where applicable, a shorting link connector fitted to the
R test socket of the relevant temperature controller (Refer to
R Tables 2, 3 and 4).

If a windshield or visor window is renewed after the rewiring has been carried out, it should be borne in mind that the wiring must be reinstated to agree with the Wiring Diagram Manual. Renewal of a D.V. or side window after rewiring will reinstate the correct wiring.

Throughout the procedures, equipment identifications are provided unbracketed for the left system and bracketed for the right system.

2. D.V. and Side Window Thermostats

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner, 12 to 14 lbf in (0.137 to 0.160 mdaN)	ULTRA-WB808-6UNC
Circuit breaker safety clips	-

B. Prepare to Substitute D.V. or Side Window Thermostats

WARNING: REMOVING THE INSULATED COVER EXPOSES A WINDOW SURFACE WHICH MAY BE VERY HOT.

(1) Trip and fit safety clips to the following left or right circuit breakers, as appropriate.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH DV WINDOW HTR SUP	14-215	1H181	D9
LH DV WINDOW HTR CONT	15-215	1H182	C10
RH DV WINDOW HTR SUP	13-216	2H181	C10
RH DV WINDOW HTR CONT	15-216	2H182	C14

(2) Gain access to the window electrical connections by removing the appropriate insulated cover (Ref. 56-11-11 or 56-11-21, Removal/Installation).

C. Substitute D.V. Window Thermostats

(1) Identify the faulty and spare thermostat flyinh leads by referring to the Wiring Diagram Manual.

(2) Unstow the spare thermostat flying leads.

(3) Using the methods detailed in the Wiring Diagram Manual, 20-42-18, proceed as follows:-

(a) Crimp end-fittings to the spare thermostat flying leads.

(b) Disconnect the faulty thermostat from the circuit by disconnecting the flying leads from in-line connector 1H190 (2H190).

(c) Connect the spare thermostat into the circuit by connecting the flying leads to the vacated sockets.

(4) Tape and stow the faulty thermostat flying leads as detailed in the Wiring Diagram Manual, 20-41-02.

D. Substitute Side Window Thermostats

(1) Identify the faulty and spare thermostat flying leads by referring to the Wiring Diagram Manual.

(2) Unstow the spare thermostat flying leads; then remove the cover from terminal block UG 2102 (UG 2101).

(3) Crimp end-fittings to the spare thermostat flying leads as detailed in the Wiring Diagram Manual, 20-42-08.

(4) Disconnect the faulty thermostat from the circuit by disconnecting the flying leads from terminal block UG 2102 (UG 2101).

(5) Connect the spare thermostat into the circuit by connecting the flying leads to the vacated terminals of the terminal block. Torque-tighten the terminal nuts to between 12 and 14 lbf in (0.137 and 0.160 mdaN).

(6) Tape and stow the faulty thermostat flying leads as detailed in the Wiring Diagram Manual, 20-41-02.

E. Conclusion

(1) Reset the circuit breakers tripped in operation B.(1).

(2) Carry out a Functional Test of the appropriate left or right D.V. and Side Window Demisting (Ref. Adjustment/Test).

(3) Refit the insulated cover (Ref. 56-11-11 or 56-11-21, Removal/Installation).

3. <u>Windshield Sensors</u>

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare to Substitute Windshield Sensors

(1) Trip and fit safety clips to the following left or right circuit breakers, as appropriate.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH W/SCREEN HTR CONT	1-213	1H142	J9
LH W/SCREEN HTR SUP	2-213	1H141	E20
RH W/SCREEN HTR SUP	14-216	2H141	F11
RH W/SCREEN HTR CONT	15-216	2H142	B17

(2) Disconnect electrical connector 1H146-A (2H146-A) from the bottom outboard corner of the windshield.

C. Substitute Windshield Sensors

(1) Refer to the Wiring Diagram Manual and, at free connector 1H146-A (2H146-A), identify the pins that connect to the faulty sensor. Next, using the removal/insertion procedures detailed in the Wiring Diagram Manual, 20-42-34, transfer these pins so that they will connect instead to the associated spare sensor.

(2) Reconnect connector 1H146-A (2H146-A), first ensuring that the mating surfaces are clean and undamaged.

D. Conclusion

(1) Reset the circuit breakers tripped in operation B.(1).

(2) Carry out a Functional Test of the left or right Windshield De-icing (Low Power Operation) (Ref. Adjustment/Test).

4. Visor Window Sensors

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
R Shorting plug 22/55	BAS8126R22B55PN
R Backshell	BAS8132-22
R Cable links	C107-24
R Parallel splices	BAS7375 TO 25-03

B. Prepare to Substitute Visor Window Sensors

(1) Trip and fit safety clips to all of the following left or right circuit-breakers, as appropriate.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH BOTTOM VISOR HTR SUP	14-215	1H225	E9
LH FLAT VISOR HTR SUP	14-215	1H221	G5
LH CURVED VISOR HTR SUP	14-215	1H223	G8
LH FLAT VISOR HTR CONT	15-215	1H222	C11
LH BOTTOM & CURVED VISOR HTR CONT	15-215	1H224	C12
RH BOTTOM VISOR HTR SUP	13-216	2H225	B10
RH CURVED VISOR HTR SUP	13-216	2H223	G10
RH FLAT VISOR HTR SUP	13-216	2H221	G13
RH FLAT VISOR HTR CONT	15-216	2H222	C15
RH BOTTOM & CURVED VISOR HTR CONT	15-216	2H224	C16

(2) If the visor is not in the up, locked position, make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29.

(3) Observing all relevant safety precautions, raise the visor to the up, locked position (Ref.

27-61-00, Adjustment/Test).

(4) Gain access to the droop nose through access panel 113 DB, as detailed in 27-61-00, Servicing.

(5) Identify electrical connector U1040 (U1032), mounted on a keel beam alongside the access panel, and then disconnect the connectors.

C. Substitute Visor Window Sensors

(1) Refer to the Wiring Diagram Manual and Tables 2, 3 and 4. At free connector U1040-A (U1032-A), identify the pin(s) that connect with the faulty sensor. Next, using the removal/insertion procedures detailed in the Wiring Diagram Manual, 20-42-34, transfer the pin(s) so that connection is made instead to the substituted sensor(s).

R (2) Where a shorting plug is required (Ref. Tables 2, 3
R and 4), use a plug 22/55 BAS8126R22B55PN, backshell
R BAS8132-22 with cable links of C107-24 and parallel
R splices BAS7375 TO 2503, fitted in accordance with
R WDM 20-42-19 and insulated in accordance with
R WDM 20-41-14. Remove protective cap from temperature
R controller test socket 1H149-B(2H149-B) and stow at
R controller handle. Fit shorting plug to test socket.

(3) Reconnect connector U1040 (U1032), first ensuring that the mating surfaces are clean and undamaged.

D. Conclusion

(1) Carry out a Functional Test of the appropriate Visor Window De-icing (Ref. Adjustment/Test).

(2) Ensure that all tools and equipment are removed from the droop nose; then refit access panel 113 DB as detailed in 27-61-00, Servicing.

NOTE: Trip appropriate circuit breaker to electrically isolate a failed window heating system.

LEFT HAND			RIGHT HAND		
DETACHABLE WINDOW 1H236	CURVED WINDOW 1H235	MAIN FLAT WINDOW 1H234	MAIN FLAT WINDOW 2H234	CURVED WINDOW 2H235	DETACHABLE WINDOW 2H236
		FAILED			
	FAILED				
FAILED					
			FAILED		
				FAILED	
					FAILED
	FAILED	FAILED			
FAILED		FAILED			
CIRCUIT BREAKER 1H225	CIRCUIT BREAKER 1H223	CIRCUIT BREAKER 1H221	CIRCUIT BREAKER 2H221	CIRCUIT BREAKER 2H223	CIRCUIT BREAKER 2H225

Visor Window Heating - Acceptable Combinations of Failed Window Heaters

Table 1 (continued)

NOTE: Trip appropriate circuit breaker to electrically isolate a failed window heating system.

LEFT HAND			RIGHT HAND		
DETACHABLE WINDOW 1H236	CURVED WINDOW 1H235	MAIN FLAT WINDOW 1H234	MAIN FLAT WINDOW 2H234	CURVED WINDOW 2H235	DETACHABLE WINDOW 2H236
FAILED	FAILED				
			FAILED	FAILED	
			FAILED		FAILED
				FAILED	FAILED
FAILED					FAILED
CIRCUIT BREAKER 1H225	CIRCUIT BREAKER 1H223	CIRCUIT BREAKER 1H221	CIRCUIT BREAKER 2H221	CIRCUIT BREAKER 2H223	CIRCUIT BREAKER 2H225

Visor Window Heating - Acceptable Combinations of Failed Window Heaters

Table 1 (concluded)

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R R R R R R R		SENSOR WIRING PHASE A			PHASE B		PHASE C	Test Socket H149-B Shorting Plug			
		CONNECTOR U1040-A(U1032-A)									
R	CONNECTOR PIN	N	M	R	L	P	Y	B	A	D	Y
R	BASIC WIRING	H164A	H165A		H167A		H190A				
R	SENSOR/S FAILED										
R	1 phase C	H164A	H165A		H167A			H190A			
R	1 phase B	H164A	H165A			H167A	H190A				
R R	1 phase B + 1 phase C	H164A	H165A			H167A		H190A			
R	1 phase A	H164A		H165A	H167A		H190A				
R R	1 phase A + 1 phase C	H164A		H165A	H167A			H190A			
R R	1 phase A + 1 phase B	H164A		H165A		H167A	H190A				
R R R	1 phase A + 1 phase B + 1 phase C	H164a		H165A		H167A		H190A			
R	2 phase C	H164A	H165A		H167A	H190A					

Curved Window, LH & RH - Substitute sensor connections
Table 2 (Sheet 1 of 3)

		SENSOR WIRING							Test Socket H149-B Shorting Plug		
		PHASE A			PHASE B		PHASE C				
		CONNECTOR U1040-A(U1032-A)									
R	CONNECTOR PIN	N	M	R	L	P	Y	B	A	D	Y
R	BASIC WIRING	H164A	H165A		H167A		H190A				
R	SENSOR/S FAILED										
R	2 phase C + 1 phase B	H164A	H165A		STOW H167A	H190A				:--:	
R	2 phase C + 1 phase A	H164A		H165A	H167A	H190A					
R	2 phase C + 1 phase A + 1 phase B	H164A		H165A	STOW H167A	H190A				:--:	
R	2 phase B	H164A	H165A				H190A	H167A			
R	2 phase B + 1 phase C	H164A	H165A		STOW H167A			H190A		:--:	
R	2 phase B + 1 phase A	H164A		H165A			H190A	H167A			
R	2 phase B + 1 phase A + 1 phase C	H164A		H165A	STOW H167A			H190A		:--:	
R	2 phase A	STOW H164A			H165A		H190A	H167A	:--:		

Curved Window, LH & RH - Substitute sensor connections
Table 2 (Sheet 2 of 3)

SENSOR WIRING	PHASE A			PHASE B		PHASE C	Test Socket H149-B Shorting Plug			
	CONNECTOR U1040-A(U1032-A)									
CONNECTOR PIN	N	M	R	L	P	Y	B	A	D	Y
BASIC WIRING	H164A	H165A		H167A		H190A				
SENSOR/S FAILED										
2 phase A + 1 phase B	STOW H164A				H165A	H190A	H167A	:--:		
2 phase A + 1 phase C	STOW H164A			STOW H167A H165A			H190A	:--:--:		
2 phase A + 1 phase B + 1 phase C	STOW H164A			STOW H167A	H165A		H190A	:--:		
2 phase C + 2 Phase B	NOTE: Electrically isolate (Ref. Table 1) Window heating cannot be made operable by sensor wiring rearrangement							Cable Link :--:		
2 phase C + 2 phase A										
2 phase A + 2 phase B										

Curved Window, LH & RH - Substitute sensor connections
Table 2 (Sheet 3 of 3)

		SENSOR WIRING							Test Socket H149-B Shorting Plug		
R		PHASE A			PHASE B		PHASE C				
R		CONNECTOR U1040-A(U1032-A)									
R	CONNECTOR PIN	G	F	J	E	H	C	B	C	B	F
R	BASIC WIRING	H143A	H144A		H146A		H189A				
R	SENSOR/S FAILED										
R	1 phase C	H143A	H144A		H146A			H189A			
R	1 phase B	H143A	H144A			H146A	H189A				
R	1 phase B + 1 phase C	H143A	H144A			H146A		H189A			
R	1 phase A	H143A		H144A	H146A		H189A				
R	1 phase A + 1 phase C	H143A		H144A	H146A			H189A			
R	1 phase A + 1 phase B	H143A		H144A		H146A	H189A				
R	1 phase A + 1 phase B + 1 phase C	H143A		H144A		H146A		H189A			
R	2 phase C	H143A	H144A		H146A	H189A					

Flat Window, LH & RH - Substitute sensor connections
Table 3 (Sheet 1 of 3)

	SENSOR WIRING							Test Socket H149-B Shorting Plug		
	PHASE A			PHASE B		PHASE C				
	CONNECTOR U1040-A(U1032-A)									
CONNECTOR PIN	G	F	J	E	H	C	B	C	B	F
BASIC WIRING	H143A	H144A		H146A		H189A				
SENSOR/S FAILED										
2 phase C + 1 phase B	H143A	H144A		STOW H146A	H189A				:--:	
2 phase C + 1 phase A	H143A		H144A	H146A	H189A					
2 phase C + 1 phase A + 1 phase B	H143A		H144A	STOW H146A	H189A				:--:	
2 phase B	H143A	H144A				H189A	H146A			
2 phase B + 1 phase C	H143A	H144A		STOW H146A			H189A		:--:	
2 phase B + 1 phase A	H143A		H144A			H189A	H146A			
2 phase B + 1 phase A + 1 phase C	H143A		H144A	STOW H146A			H189A		:--:	

Flat Window, LH & RH - Substitute sensor connections
Table 3 (Sheet 2 of 3)

	SENSOR WIRING							Test Socket H149-B Shorting Plug		
	PHASE A			PHASE B		PHASE C				
	CONNECTOR U1040-A(U1032-A)									
CONNECTOR PIN	G	F	J	E	H	C	B	C	B	F
BASIC WIRING	H143A	H144A		H146A		H189A				
SENSOR/S FAILED										
2 phase A	STOW H143A			H144A		H189A	H146A	:--:		
2 phase A + 1 phase B	STOW H143A				H144A	H189A	H146A	:--:		
2 phase A + 1 phase C	STOW H143A			STOW H146A / H144A			H189A	:--:--:		
2 phase A + 1 phase B + 1 phase C	STOW H143A			STOW H146A	H144A		H189A	:--:		
2 phase C + 2 Phase B / 2 phase C + 2 phase A / 2 phase A + 2 phase B	NOTE: Electrically isolate (Ref. Table 1) Window heating cannot be made operabce by sensor wiring rearrangement							Cable Link :--:		

Flat Window, LH & RH - Substitute sensor connections
Table 3 (Sheet 3 of 3)

	SENSOR WIRING						Test Socket H149-B Shorting Plug	
	GROUP A			GROUP B				
	PINS							
CONNECTOR UA1040	V	U	W	S	T	X		
CONNECTOR UA1032	X	W	T	U	Y	S	BB	FF
BASIC WIRING	H179A	H180A		H181A	H182A			
SENSOR/S FAILED								
1 Group B	H179A	H180A		H181A		H182A		
1 Group A	H179A		H180A	H181A	H182A			
1 group A + 1 Group B	H179A		H180A	H181 A		H182A		
2 Group B	H179A	H180A	H182A	STOW H181A			:--:	
2 Group A	STOW H179A				H182A	H180A	:--:	
2 Group A + 1 Group B / 2 Group B + 1 Group A	NOTE: Electrically isolate (Ref. Table 1) Window heating cannot be made operable by sensor wiring rearrangement						Cable Link :--:	

Detachable Window, LH & RH - Substitute Sensor Connections
Table 4

TEMPERATURE CONTROLLER - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Two temperature controllers, one each for the left and right windshield and visor window heating systems, are mounted as sub-units of Elfin case assemblies, which are located in the flight compartment racking on shelves 10-215 and 9-216 respectively.

2. Temperature Controller

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare

(1) Trip and fit safety clips to the appropriate circuit breakers listed below.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH Controller			
LH W/SCREEN HTR CONT	1-213	1H142	J9
LH FLAT VISOR HTR CONT	15-215	1H222	C11
LH BOTTOM & CURVED VISOR HTR CONT	15-215	1H224	C12
RH Controller			
RH W/SCREEN HTR CONT	15-216	2H142	B17
RH FLAT VISOR HTR CONT	15-216	2H222	C15

R

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
RH BOTTOM & CURVED VISOR HTR CONT	15-216	2H224	C16

(2) Remove the appropriate cover from the flight compartment racking and identify the controller (Equipment ident. Nos.1H149A and 2H149A for the LH and RH controllers respectively).

C. Remove

NOTE: The following procedures apply to the controllers as sub-units of Elfin cases; for removal and installation of Elfin case assemblies, refer to 25-71-00.

(1) Release the captive screws securing the unit to the Elfin case assembly.

(2) Carefully withdraw the unit from the Elfin case.

D. Install

(1) Comply with the electrical safety precautions.

(2) Check the electrical connectors and ensure that all pins, inserts and mating surfaces are clean and undamaged.

(3) Carefully slide the unit into the appropriate Elfin case position.

(4) Ensure that the electrical connectors are correctly mated, then secure the unit to the Elfin case with the captive screws. Check that the unit is electrically bonded in accordance with 20-27-11.

E. Conclusion

(1) Refit and secure the cover to the flight compartment racking.

(2) Reset the circuit breakers tripped before removal.

(3) Carry out an Operational Test of the appropriate

windshield and visor window de-icing
(Ref. 30-41-00).

STATIC DISCHARGE UNIT - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

R 1. General

Static discharge units (SDUs) are fitted in the visor window and the windshield LH and RH heating circuits. The visor window SDUs are mounted in the droop nose assembly on the LH and RH side of the foremost access door. The windshield SDUs are mounted at the forward end of the pilots' LH and RH side consoles respectively.

R 2. Visor Window Static Discharge Unit (Ref. Fig. 401)

R

A. Equipment and Materials

R

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

R

R

B. Prepare to Remove Visor Window SDU

(1) Ensure that the appropriate LH or RH VISOR DE ICE switch on the pilots' roof panel, 4-211, is at OFF.

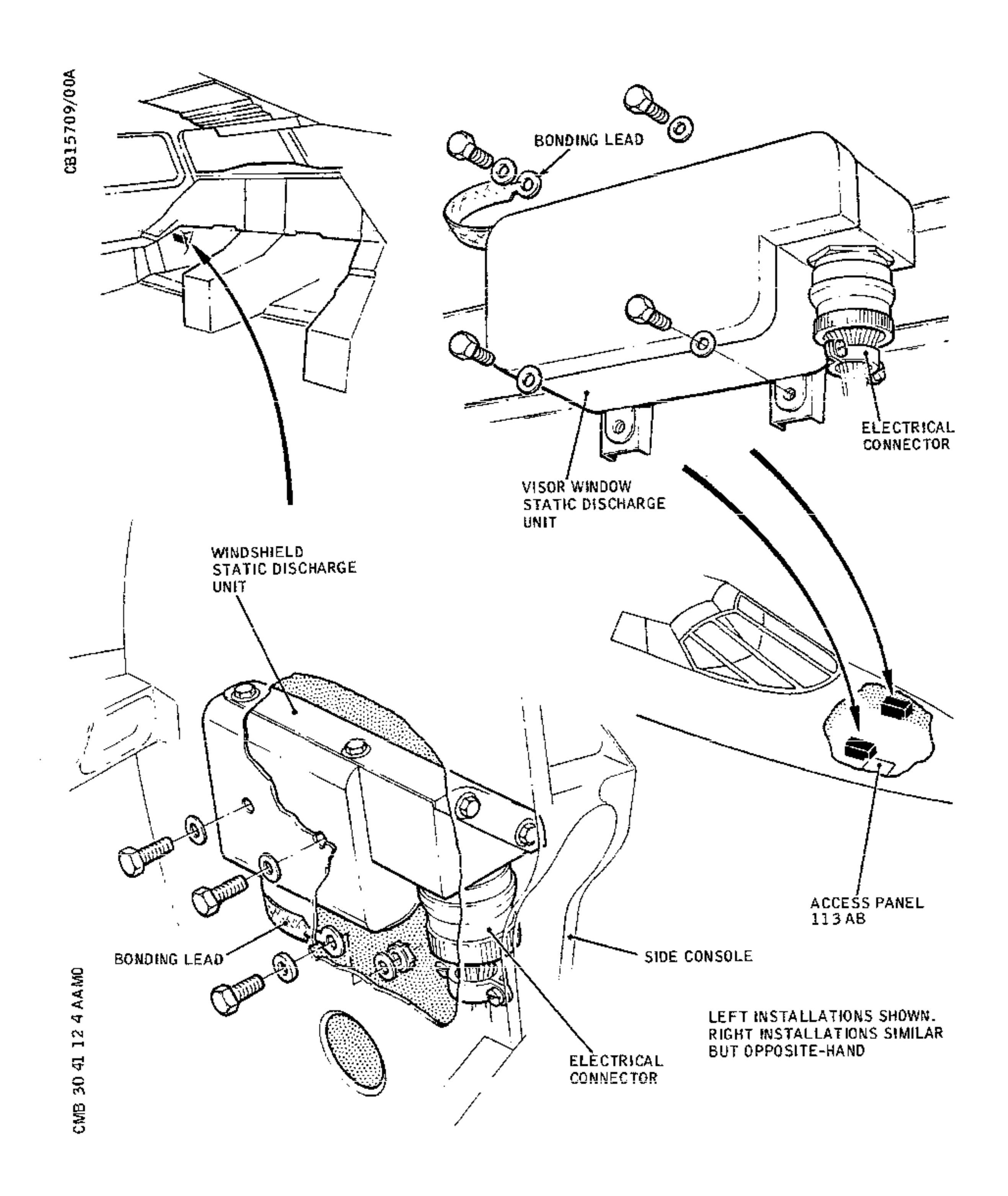
R (2) Trip all the LH or RH circuit breakers listed below, and fit safety clips.

R

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH FLAT VISOR HTR SUP	14-215	1H221	G5
LH CURVED VISOR HTR SUP	14-215	1H223	G8
LH BOTTOM VISOR HTR SUP	15-215	1H225	E9
RH FLAT VISOR HTR SUP	13-216	2H221	G13
RH CURVED VISOR HTR SUP	13-216	2H223	G10
RH BOTTOM VISOR HTR SUP	13-216	2H225	B10

R

R



R - Static Discharge Unit - Installation
Figure 401

(3) Gain access to the droop nose assembly, through access door 113 AB, as detailed in 27-61-00, Servicing.

C. Remove Visor Window SDU

(1) Identify the appropriate SDU and disconnect the electrical connector.

R (2) Disconnect the bonding lead at the structure end
R by removing the appropriate fixing bolt and washer.

R (3) Support the SDU and remove the remaining fixing bolts and washers.

R (4) Remove the SDU complete with bonding lead.

D. Install Visor Window SDU

(1) Comply with the precautions taken before removal.

(2) Position the SDU, complete with bonding lead, in the droop nose assembly and secure it with the bolts and washers. Ensure that the free end of the bonding lead is secured under the adjacent fixing bolt and
R washer, and then check the electrical bonding in accordance with 20-27-11.

(3) Connect the electrical connector to the SDU, ensuring that the mating surfaces are clean and undamaged.

E. Conclusion

(1) Remove all tools and test equipment from the droop nose assembly.

(2) Close the access door 113 AB as detailed in 27-61-00, Servicing.

(3) Remove the safety clips and reset the circuit breakers tripped before removal.

(4) Carry out an Operational Test of the appropriate system as detailed in 30-41-00, Adjustment/Test.

3. Windshield Static Discharge Unit (Ref. Fig. 401)
R

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare to Remove Windshield SDU

(1) Ensure that the appropriate W/SHIELD DE ICE switch is at OFF.

(2) Trip the appropriate circuit breaker, listed below, and fit a safety clip.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH W/SCREEN HTR SUP	2-213	1H141	E20
RH W/SCREEN HTR SUP	14-216	2H141	F11

(3) Remove the forward trim panel from the LH or RH console, as appropriate.

C. Remove Windshield SDU

(1) Disconnect the electrical connector from the SDU.

(2) Remove the nut, bolt and washers securing the bonding lead to the side console structure.

(3) Support the SDU and remove the fixing bolts and washers; withdraw the SDU, complete with bonding lead, from the console.

D. Install Windshield SDU

(1) Comply with the electrical safety precautions.

(2) Position the SDU in the appropriate side console and secure it with the bolts and washers.

(3) Fit the bonding lead to the side console structure and secure it with the nut, bolt and washers, ensuring that the thick washer is under the

R bolt-head and the thin washer is under the nut. Check the electrical bonding in accordance with 20-27-11.

R (4) Connect the electrical connector to the SDU, ensuring that the mating surfaces are clean and undamaged.

E. Conclusion

R (1) Position and secure the console trim panel.

R (2) Remove the safety clip and reset the circuit breaker tripped before removal.

(3) Carry out an Operational Test of the appropriate
R system, as detailed in 30-41-00, Adjustment/Test.

STATIC DISCHARGE UNIT - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

ALL PERSONNEL MUST REMAIN CLEAR WHEN THE VISOR IS OPERATED.

DO NOT LEAVE HEATED GLAZINGS UNATTENDED.

1. General

The following Functional Tests check that all the capacitors comprising a static discharge unit (SDU) are serviceable. Throughout the tests equipment identifications are provided unbracketed for the LH system and bracketed for the RH system. Operational and System Tests are not considered necessary.

2. Functional Test - Windshield SDU

A. Equipment and Materials

DESCRIPTION	PART NO.
500 V insulation resistance meter (battery controlled)	Evershed and Vignoles or equivalent
Circuit breaker safety clips	-

B. Prepare

CAUTION: ENSURE THAT THE VISOR AND FLIGHT COMPARTMENT WINDOWS ARE FREE FROM PROTECTIVE COVERS, ETC.

(1) Ensure that both system W/SHIELD DE ICE switches, on flight compartment roof panel 4-211, are set to the OFF position.

(2) Trip and fit safety clips to the appropriate LH or RH system circuit breakers listed below.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH W/SCREEN HTR CONT	1-213	1H142	J9

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
LH W/SCREEN HTR SUP	2-213	1H141	E20
RH W/SCREEN HTR SUP	14-216	2H141	F11
RH W/SCREEN HTR CONT	15-216	2H142	B17

(3) Make available electrical ground power as detailed in 24-41-00.

(4) If the visor is not in the fully down position, proceed as follows:

(a) Make available hydraulic ground power and pressurize the Green hydraulic system as detailed in 29-11-00, Servicing.

(b) Observing all relevant safety precautions, unlock and lower the visor (Ref. 27-61-00).

(5) Place a warning notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

C. Test

WARNING: CAPACITORS MAY RETAIN THEIR 500V TEST CHARGE AND SHOULD BE SUBJECTED TO CONTROLLED DISCHARGE AFTER TESTING.

B (1) Disconnect connector 1H146 (2H146) from the bottom
B outboard corner of the windshield. In addition,
RB disconnect U-1828 and U-1825 (23-123 and 21-123
B respectively). Ref. WDM 30-41-11 page 4 sheet 2 and
B WDM 30-41-21 page 4 sheet 2.

(2) Connect the insulation resistance meter between a suitable earth and pin 'm' of the free connector.

(3) If necessary, set the insulation resistance meter to 500V.

(4) Operate the meter test switch and check that the meter indicates an initial swing to approximately 5 Mohm, followed by a slow increase in value toward infinity. Absence of the initial swing indicates an open circuit.

(5) Repeat operations (2), (3), and (4) at pins 'p' and 'r' in turn.

(6) Reconnect connector 1H146 (2H146) to the bottom
R B outboard corner of the windshield. Reconnect plugs
R B U-1828 and U-1825.

(7) Reset the circuit breakers tripped in operation B.(2).

(8) Carry out an Operational Test of the Windshield De-icing as detailed in 30-41-00, Adjustment/Test.

D. Conclusion

(1) Remove the warning notice from the centre console.

(2) If the visor was operated during Preparation, depressurize the green hydraulic system and disconnect hydraulic ground power as detailed in Chapter 29.

(3) Switch off and disconnect electrical ground power as detailed in 24-41-00.

3. Functional Test - Visor Window SDU

A. Equipment and Materials

DESCRIPTION	PART NO.
500 V insulation resistance meter (battery controlled)	Evershed and Vignoles or equivalent
Circuit breaker safety clips	-

B. Prepare

CAUTION: ENSURE THAT THE VISOR AND FLIGHT COMPARTMENT WINDOWS ARE FREE FROM PROTECTIVE COVERS, ETC.

(1) Ensure that both system VISOR DE ICE switches, on flight compartment roof panel 4-211, are set to the OFF position.

(2) Trip and fit safety clips to the appropriate LH or RH system circuit breakers listed below.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH BOTTOM VISOR HTR SUP	14-215	1H225	E9
LH FLAT VISOR HTR SUP	14-215	1H221	G5
LH CURVED VISOR HTR SUP	14-215	1H223	G8
LH FLAT VISOR HTR CONT	15-215	1H222	C11
LH BOTTOM & CURVED VISOR HTR CONT	15-215	1H224	C12
RH BOTTOM VISOR HTR SUP	13-216	2H225	B10
RH CURVED VISOR HTR SUP	13-216	2H223	G10
RH FLAT VISOR HTR SUP	13-216	2H221	G13
RH FLAT VISOR HTR CONT	15-216	2H222	C15
RH BOTTOM & CURVED VISOR HTR CONT	15-216	2H224	C16

(3) Make available electrical ground power as detailed in 24-41-00.

(4) If the visor is not in the fully up, locked, position, proceed as follows:-

(a) Make available hydraulic ground power and pressurize the green hydraulic system as detailed in Chapter 29.

(b) Observing all relevant safety precautions, raise the visor to the up, locked, position (Ref. 27-61-00).

(5) Place a notice on the flight compartment centre console prohibiting the use of all nose and visor controls by unauthorized persons.

C. Test

(1) Gain access to the visor 'A' frame by removing

access panel 113 BB as detailed in 27-61-00, Servicing.

(2) Locate plug-break U1035 (U1036) on the 'A' frame and disconnect the connectors.

(3) Connect a battery-operated insulation resistance meter between a suitable earth and pin 'k' of connector U1035-B (U1036-B).

(4) If necessary, set the insulation resistance meter to 500 V.

(5) Operate the meter test switch and check that the meter indicates an initial swing to approximately 5 Mohm, followed by a slow increase in value toward infinity. Absence of the initial swing indicates an open circuit.

(6) Repeat operations (3), (4) and (5) at pins 'm', 'n', 'p', 'q', 'r' and 't' in turn.

(7) Reconnect plug-break U1035 (U1036) on the visor 'A' frame and close access panel 113 BB as detailed in 27-61-00, Servicing.

(8) Reset the circuit breakers tripped in operation B.(2).

(9) Carry out an Operational Test of the Visor Window De-icing as detailed in 30-41-00, Adjustment/Test.

D. Conclusion

(1) Remove the warning notice from the centre console.

(2) If the visor was operated during Preparation, depressurize the green hydraulic system and disconnect hydraulic ground power as detailed in Chapter 29.

(3) Switch off and disconnect electrical ground power as detailed in 24-41-00.

RAIN DISPERSAL SYSTEM - DESCRIPTION AND OPERATION

NOTE: The rain repellent fluid system has been rendered inoperative. To restore and enhance the rain repellent capability, Surfex 100 rain repellent coating has been applied to the flight deck windshields. (Ref. 12-30-30).

**ON A/C 006-007

NOTE: The windshield wash system has been rendered inoperative.

1. General (Ref. Fig. 001)

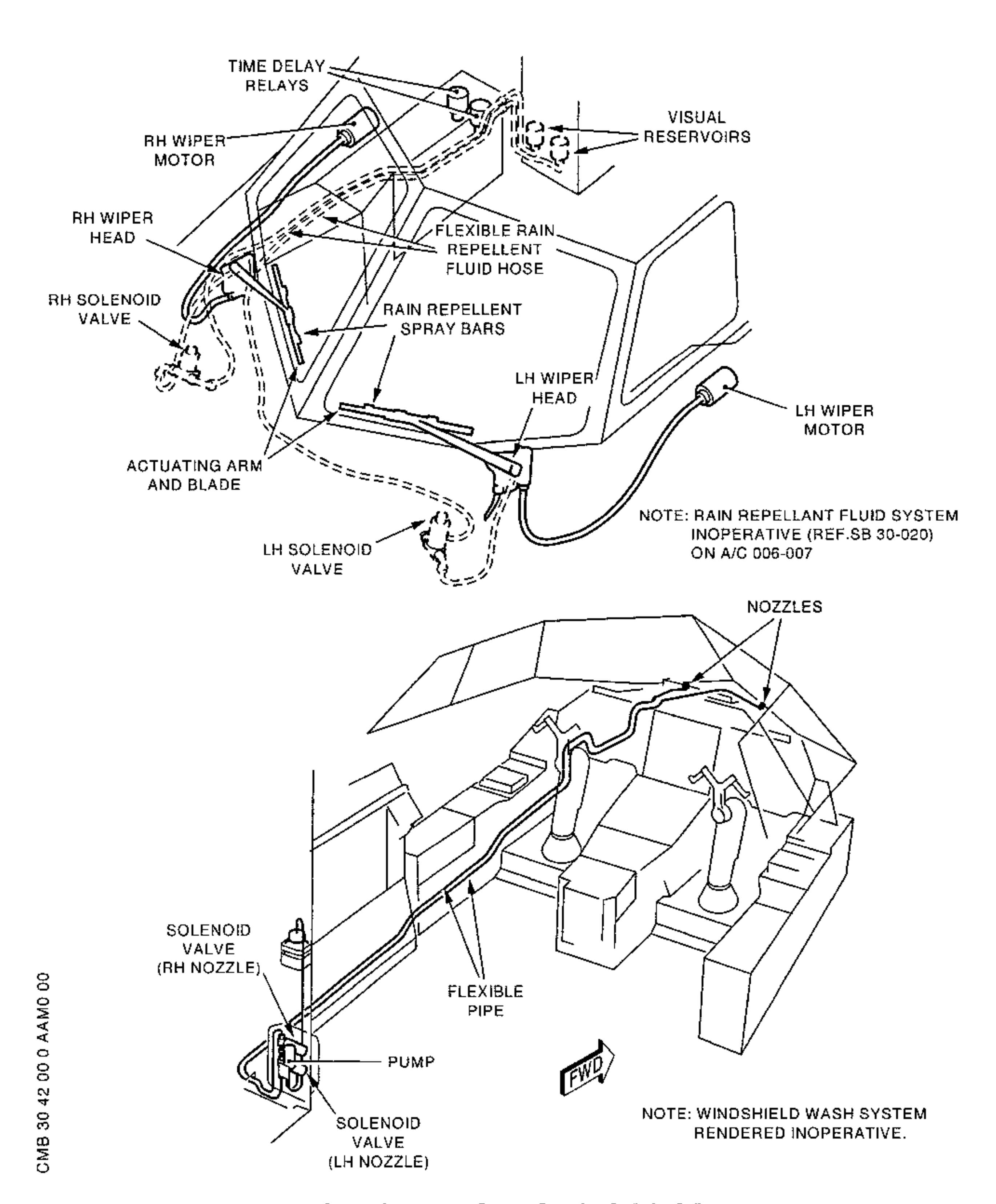
The rain dispersal system, comprising the windshield wiper system, is used to maintain visibility through the windshields during rainfall of all intensities with the visor lowered. The system is independently controlled for each windshield, from control switches located on the centre console. A rain deflector, which is fitted immediately below the windshields, deflects water away from the windshields when the droop nose is down and also assists in clearing water from the wiper downstroke.

Each windshield wiper system comprises a two speed wiper motor/control unit connected to a wiper head by a flexible drive shaft. An actuating arm, incorporating a rain repellent fluid spray bar rendered inoperative, and wiper blade assembly is attached to the splined spigot of the wiper head.

Electrical supply for the left hand rain dispersal system is from the essential busbars for the windshield wiper. The right-hand rain dispersal system is supplied from the main busbars.

2. Wiper Motors

The left-hand and right-hand wiper motors (Ref. Fig. 002) are identical and are mounted on the aircraft structure by means of an adjustable saddle block and two attachment straps behind access panels in the furnishing trim below the flight compartment side windows. A flexible drive shaft is connected to the forward end of the unit and the electrical connection is made at the receptacle on the rear.



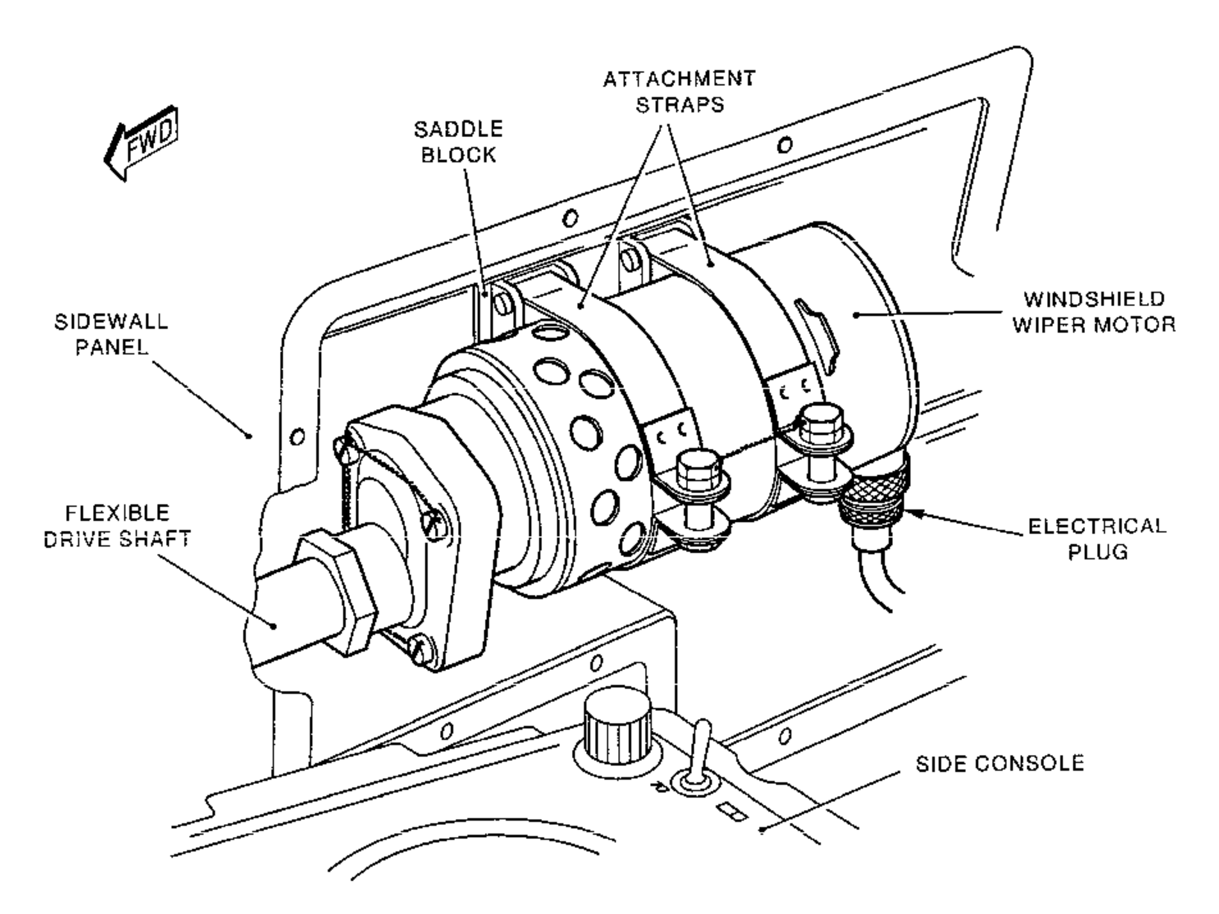
Rain Dispersal and Windshield
Wash System
Figure 001

The wiper motor is a two speed, squirrel cage induction type, which has a single winding arranged as a delta for the low speed and as a star for the fast speed. The unit is self ventilated by an integral fan mounted on its shaft, and the rear part of the casing contains the control relays. The relays, energized from the control switch by a 28 volt d.c. supply, permit a 115 volt a.c. supply to be connected to the motor winding (Ref. Fig. 007). They also switch the winding from delta to star when a change of speed is selected on the control switch, and ensure that when the switch is set at "OFF" the actuating arm travels to the bottom of the screen before the supply is shut off.

The motor assembly contains an electromagnetic brake, which is applied immediately the 115V a.c. supply is shut off, to stop the actuating arm over-running when switched off.

3. Flexible Drive Shafts (Ref. Fig. 002)

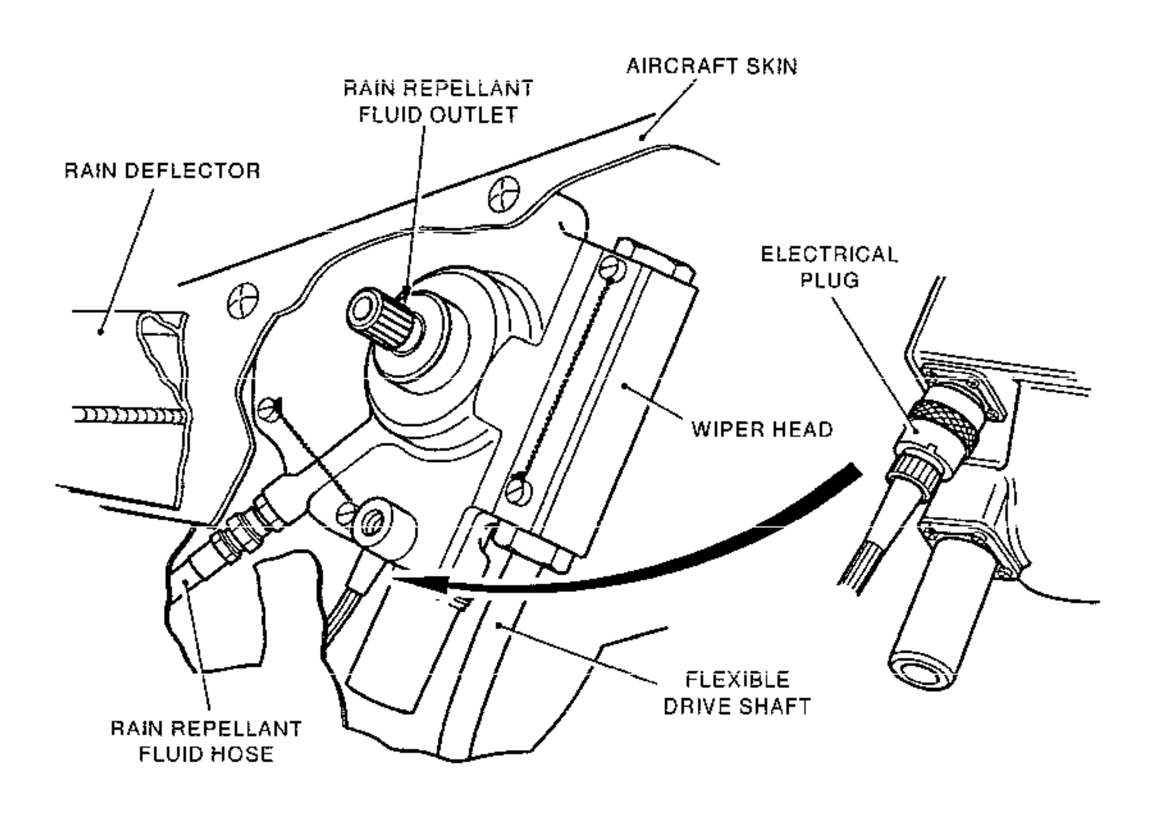
The drive shaft transmits the rotary movement of the motor, to the associated wiper head (Ref. Fig. 001). The shaft comprises an outer flexible sheath with two crimped end fittings and two coupling nuts, and a rotational inner cable, the ends of which have square sockets. The shaft is located in a guide tube, which is installed as part of the aircraft structure, and apart from the connections to the motor and wiper head there are no other attachments along its length.



Windshield Wiper Two Speed Motor
Figure 002

4. Wiper Heads (Ref. Fig. 003 and 005)

Two wiper heads, one located immediately beneath each windshield, control the associated wiper actuating arms. The head casing is bolted to the forward pressure bulkhead so that the splined shaft, projecting forward from the casing, passes through a hole in the pressure bulkhead. The blade pressure is controlled by the arm attachment assembly at as near 16 lb (7.26 kg) load as possible. Each of the heads is similar and differ only in that they are handed.



Windshield Wiper Head
Figure 003

Each wiper head comprises a worm gear with a squared end drive connection, coupled to a reduction gear which drives the actuating arm and blade via a splined shaft.

Mechanical or electrical failure of the main drive to the wiper head, will have probably stopped the actuating arm in the wiped area of the windshield.

The emergency parking motor, being controlled by internal microswitches, is used to drive the actuating arm to the bottom of its stroke.

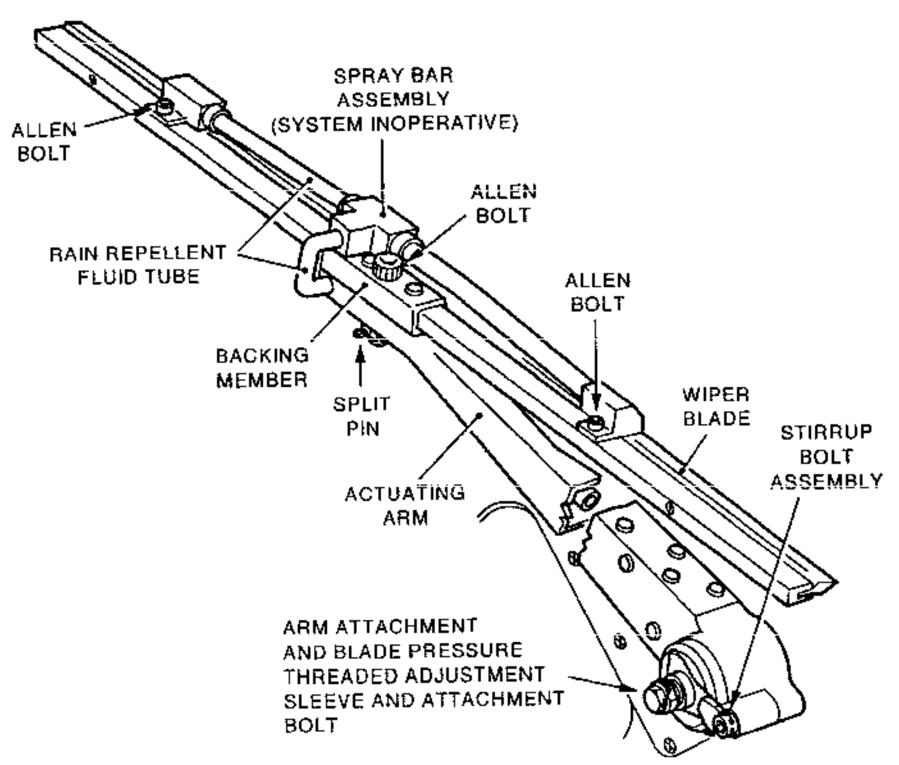
When the control switch is moved from "OFF" to "LOW" or "HIGH" the supply energizes via microswitch SW2, the two or four relays respectively in the wiper motor. The drive from the wiper motor then commences and microswitch SW6, which is electrically inactive, opens and closes alternatively until the wiper is switched off. Microswitch SW6 is in the closed Wiped Area position for the major portion of the wiper blade sweep and opens contacts over a minimum area at the bottom of the windshield.

Therefore when the control switch is moved from "LOW" or "HIGH" to "OFF", wiping continues until microswitch SW6 opens at the bottom of the wiper stroke stopping the wiper motor. Micro-switch SW1 delivers a signal to the visor circuit (Ref. 27-61-00) indicating the wiper assembly is parked.

The cover of the wiper head contains a duct which allowed the rain repellent fluid to pass from the hose connection to the actuating arm via an annular chamber and a drilling through the wiper drive shaft.

5. Actuating Arm, Spray Bar and Wiper Blade Assembly
(Ref. Fig. 004)

The actuating arm assembly consists of a stainless steel cranked arm, attached to the wiper head at one end, and a wiper blade and rain repellent spray bar, rendered inoperative, at the other. The arm has a splined sleeve for attachment to the splined shaft of the wiper head which facilitates the setting of the angular alignment of the arm to the head. The blade pressure on the windshield is adjusted by means of the threaded adjustment sleeve. The arm is retained on the wiper head spindle by a shouldered attachment bolt. A stirrup bolt is set in the wiper head end of the arm to facilitate the removal of the arm and to enable the blade pressure to be decreased.



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Actuating Arm and Repellent Spray Bar
Figure 004

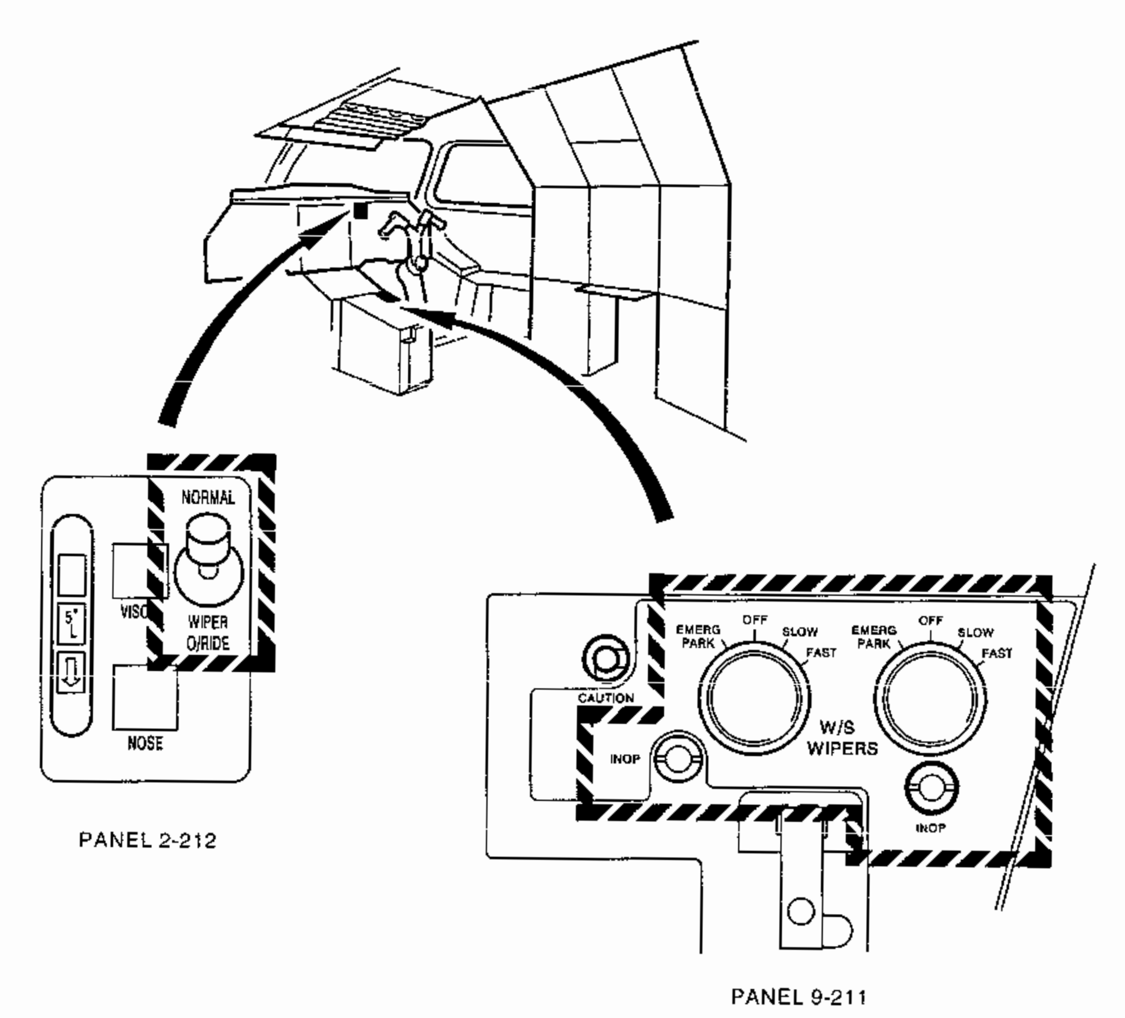
The wiper blade, which is a consumable part and can be removed without removing the arm, consists of a Teflon-sprayed rubber extrusion set in a light alloy backing member.

The left-hand and right-hand arms are identical except that they are handed.

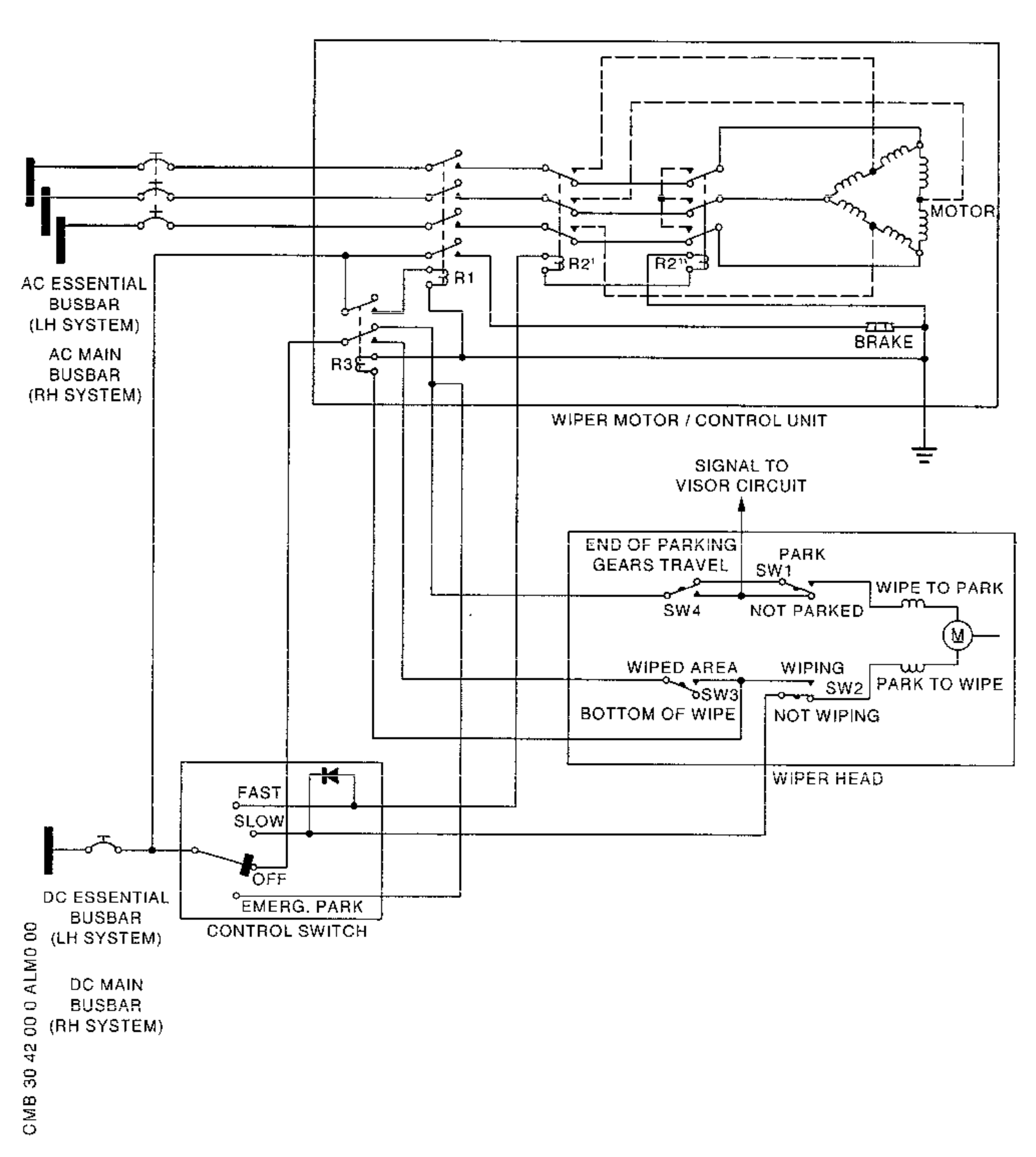
6. Control Switches (Ref. Fig. 005)

The control switches for the wiper systems are located on panel 9-211. The wiper control switch is a four position rotary switch used to select "OFF", "SLOW", "FAST" and "EMERG PARK".

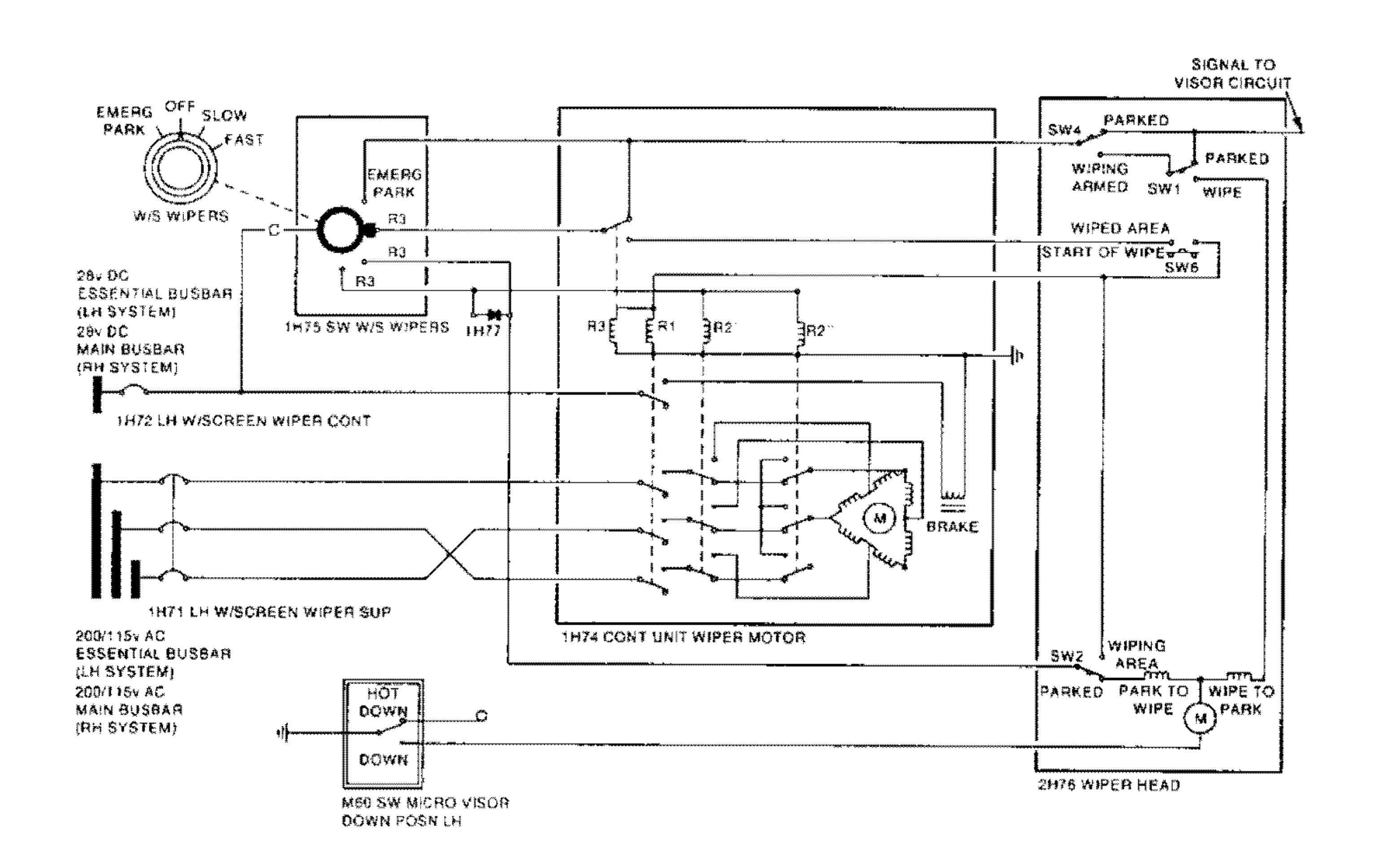
The "WIPER O/RIDE" switch is located on panel 9-212 (Ref. 27-61-00, Description and Operation).



Rain Dispersal Controls
Figure 005



Windshield Wiper Control - Schematic Diagram
Figure 006



Windshield Wiper Control -
Schematic Diagram
Figure 006

EFFECTIVITY: 006-007,

BA

7. Operation

A. Rain Dispersal System

(1) With 28V d.c. and 115V a.c. electrical power available, either or both the left and right-hand rain dispersal systems can be operated from the centre console panel (Ref. Fig. 005).

B. Windshield Wiper System (Ref. Fig. 006)

The wiper is switched on by turning the control switch clockwise from "OFF" to "SLOW". This energizes relays R3 and R1 in the wiper motor.

Relay R3 energizes the circuit to microswitch SW6 in readiness for the "OFF" position when selected. Simultaneously, relay R1 permits a 115V a.c. supply to be connected directly to the delta wiring of the motor, and also permits a 28V d.c. supply to energize the electromagnetic brake, thus releasing the motor.

The wiper speed is increased by turning the control switch clockwise from "SLOW" to "FAST". The relays R2' and R2" will then become energized and change the motor wiring from delta to star in order to obtain the higher speed.

During these sequences of operation, no signal is delivered to the visor circuit (Ref. 27-61-00), and microswitch SW6, which is electrically inactive, opens and closes in time with the actuating arm movement.

The wiper is switched "OFF" by turning the control switch counter-clockwise from "FAST" or "SLOW". The actuating arm continues to move through its arc of travel until it reaches the bottom of its stroke when microswitch SW6 opens. This interrupts the supply to R1 and R3, thereby switching off the wiper motor and applying the electromagnetic brake. The actuating arm is now parked at the bottom of its stroke on the windshield. In this position, SW1 delivers a signal to the visor circuit (Ref. 27-61-00) indicating that the actuating arm is parked and allowing the visor to be raised. In event of failure of the wiper within the swept area, the actuating arm is parked by selecting "EMERG PARK" on the control switch. The 28V d.c. supply is then connected via SW4 and SW1 to the emergency parking motor.

The actuating arm will be moved to the park position at the bottom of its stroke, but if "EMERG PARK" is selected when the actuating arm is at or near the top of its stroke, the emergency parking motor will only move the arm to within 20 deg from the start of its stroke.

A signal is then delivered to the visor circuit via microswitch SW1 or SW4 allowing the visor to be raised.

To move the control switch to "OFF" from "EMERG PARK" the central knob must be lifted before turning.

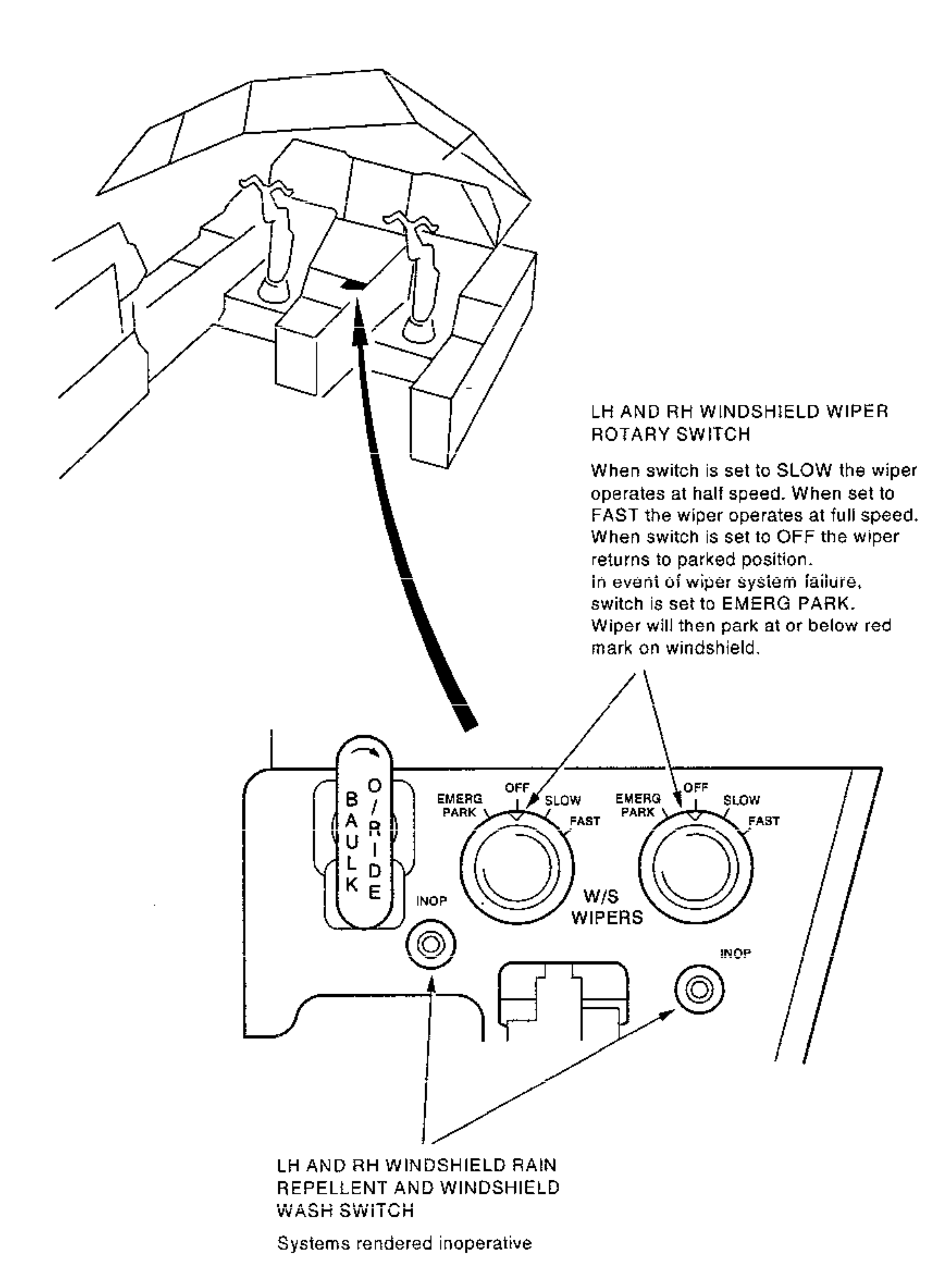
C. System Management (Ref. Fig. 007)

The windshield wipers are used to clear rain from the windshield. The control switches for the wipers are grouped on the centre console sub-panel 9-211-3.

To use the wipers, the visor must be in the lowered position, the ground electrical supply connected and the windshield lubricated with water. The wiper control switch must be set to "OFF" before the windshield is dry.

D. Power Supplies

SERVICES	BUSBAR	C.B. PANEL
LH WINDSHIELD WIPER SYSTEM	AC Essential 5 and 6 DC Essential A	2-213 1-213
RH WINDSHIELD WIPER SYSTEM	AC Main 4 DC Main 8	14-216 15-216



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System Management
Figure 007

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RAIN DISPERSAL SYSTEM - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN CHAPTER 24.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. para.3), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, and that electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

This trouble shooting covers the windshield wiper systems and applies to both the LH and RH systems which are independently operated. The visor and droop nose must be fully lowered, the droop nose locked and the associated circuit breakers tripped before attempting to carry out any trouble shooting procedure. Trouble shooting of the windshield wiper override switch is detailed in 27-61-00, Trouble Shooting.

2. Preparation

A. Make available electrical ground power (Ref. 24-41-00, Servicing).

B. Fully lower the visor and the droop nose (Ref. 27-61-00, Adjustment/Test).

C. Trip the circuit breakers associated with the visor and droop nose, and secure them in position with safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
NOSE 7 1/2 DEG CONT	1-213	M 12	Q16
NOSE/VISOR STBY LOWER SUP		M 13	Q17
VISOR AND NOSE CONT	15-215	M 11	F 8

D. Place a warning placard on the visor and droop nose section of the pilots dash panel indicating that the visor and droop nose must not be operated.

E. Remove the access panels 113BB and 113CB and fit the locking sleeves of the droop nose actuator. (Ref. 27-61-00, Adjustment/Test).

F. Clean each windshield with water, using a lint-free cloth.

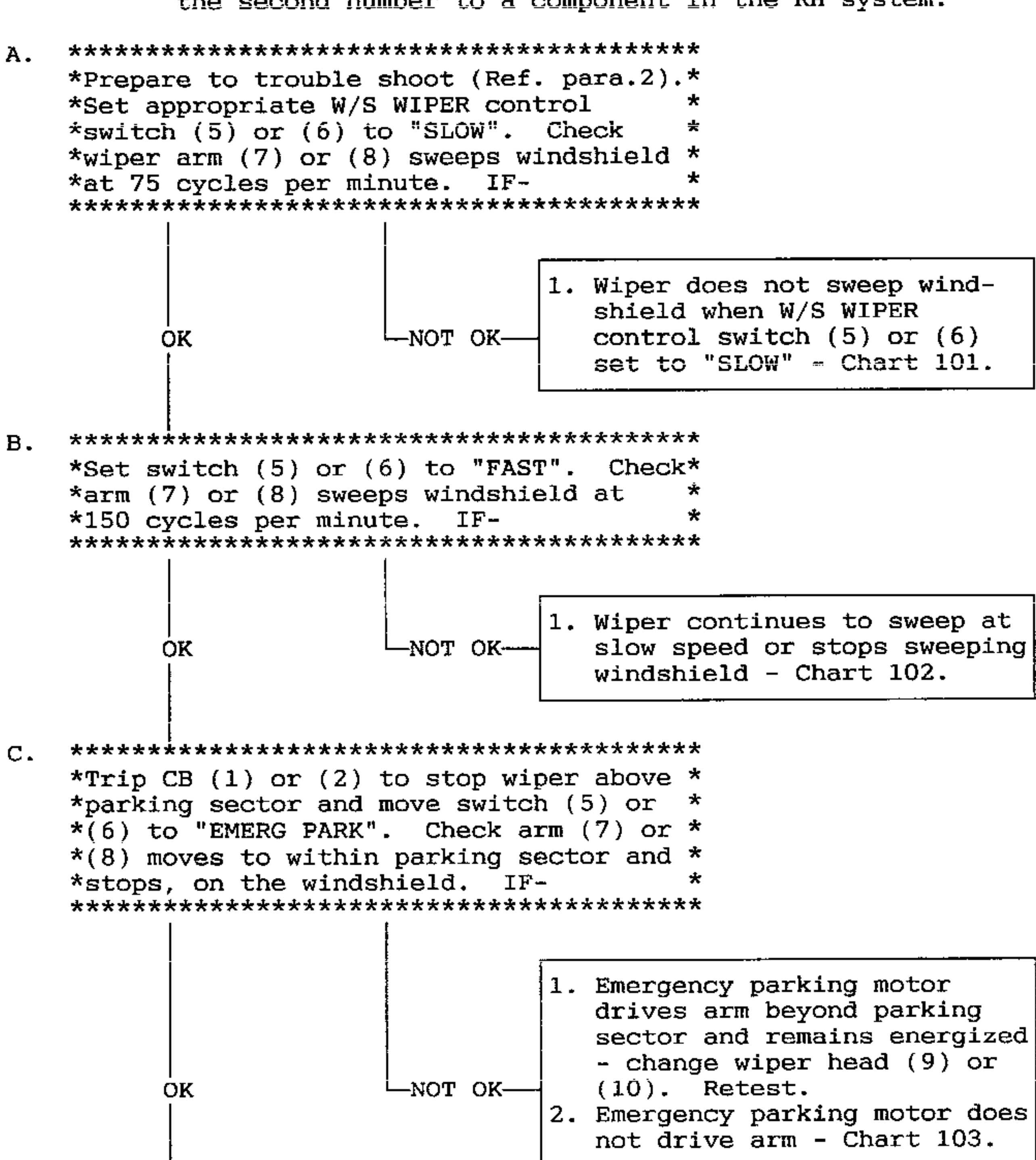
CAUTION: WHEN THE WINDSHIELD WIPERS ARE OPERATED FOR TROUBLE SHOOTING PURPOSES THE WINDSHIELDS MUST BE CONTINUOUSLY LUBRICATED WITH WATER.

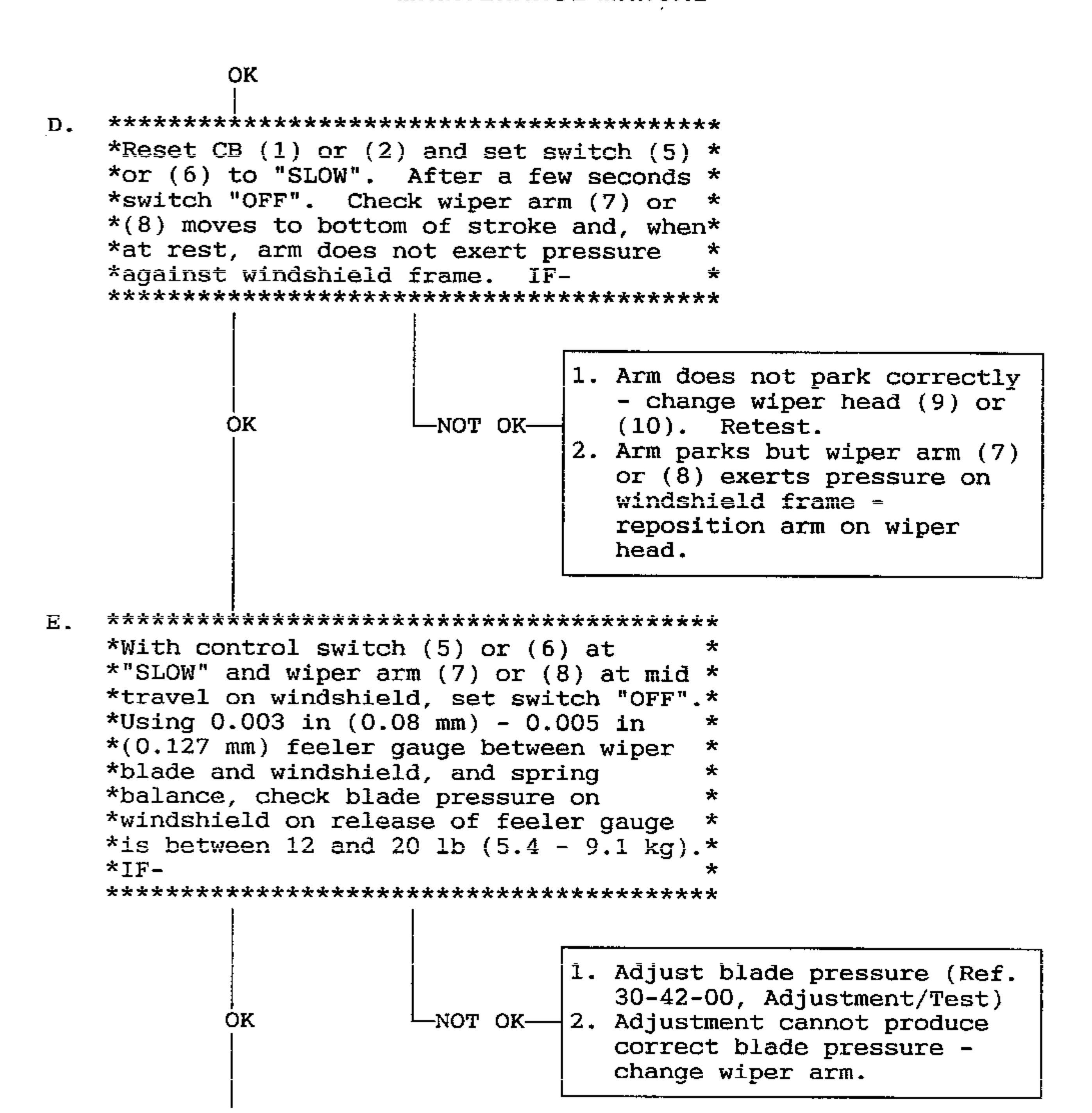
G. Ensure that the associated circuit breakers are set (Ref. Table 101).

H. Check that windshield wiper blades are serviceable and renew if necessary (Ref. 30-42-14, Removal/Installation).

3. Trouble Shooting - Windshield (W/S) Wiper System LH or RH

NOTE: Where reference is made to two bracketed numbers, the first number refers to a component in the LH system and the second number to a component in the RH system.




OK
D.
*Reset CB (1) or (2) and set switch (5) *
*or (6) to "SLOW". After a few seconds *
*switch "OFF". Check wiper arm (7) or *
(8) moves to bottom of stroke and, when
*at rest, arm does not exert pressure *
*against windshield frame. IF- *
OK
NOT OK
1. Arm does not park correctly - change wiper head (9) or (10). Retest.
2. Arm parks but wiper arm (7) or (8) exerts pressure on windshield frame - reposition arm on wiper head.
E.
*With control switch (5) or (6) at *
*"SLOW" and wiper arm (7) or (8) at mid *
travel on windshield, set switch "OFF".
*Using 0.003 in (0.08 mm) - 0.005 in *
*(0.127 mm) feeler gauge between wiper *
*blade and windshield, and spring *
*balance, check blade pressure on *
*windshield on release of feeler gauge *
is between 12 and 20 lb (5.4 - 9.1 kg).
*IF- *
OK
NOT OK
1. Adjust blade pressure (Ref. 30-42-00, Adjustment/Test)
2. Adjustment cannot produce correct blade pressure - change wiper arm.

```
        |
        OK
        |
F.   ****************************************
     *Clean each windshield with damp,       *
     *grit-free chamois leather.  Polish     *
     *with lint-free cloth.                  *
     *                                       *
     *Remove droop nose actuator locking     *
     *sleeves, and fit access panels 113BB   *
     *and 113CB.                             *
     *                                       *
     *Remove warning placards, check droop   *
     *nose and visor selector is at NOSE     *
     *DOWN, VISOR DOWN.  Remove CB safety    *
     *clip and reset CB.  Switch off         *
     *electrical ground power.               *
     ****************************************
```

```
*******************************
*W/S WIPER DOES NOT MOVE FROM *
*PARK TO WIPE WHEN "SLOW"     *
*SELECTED.                    *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLY 200V 3 PHASE	-
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-

NOTE: Before renewal of components (*), check the preceding run of wiring for continuity.

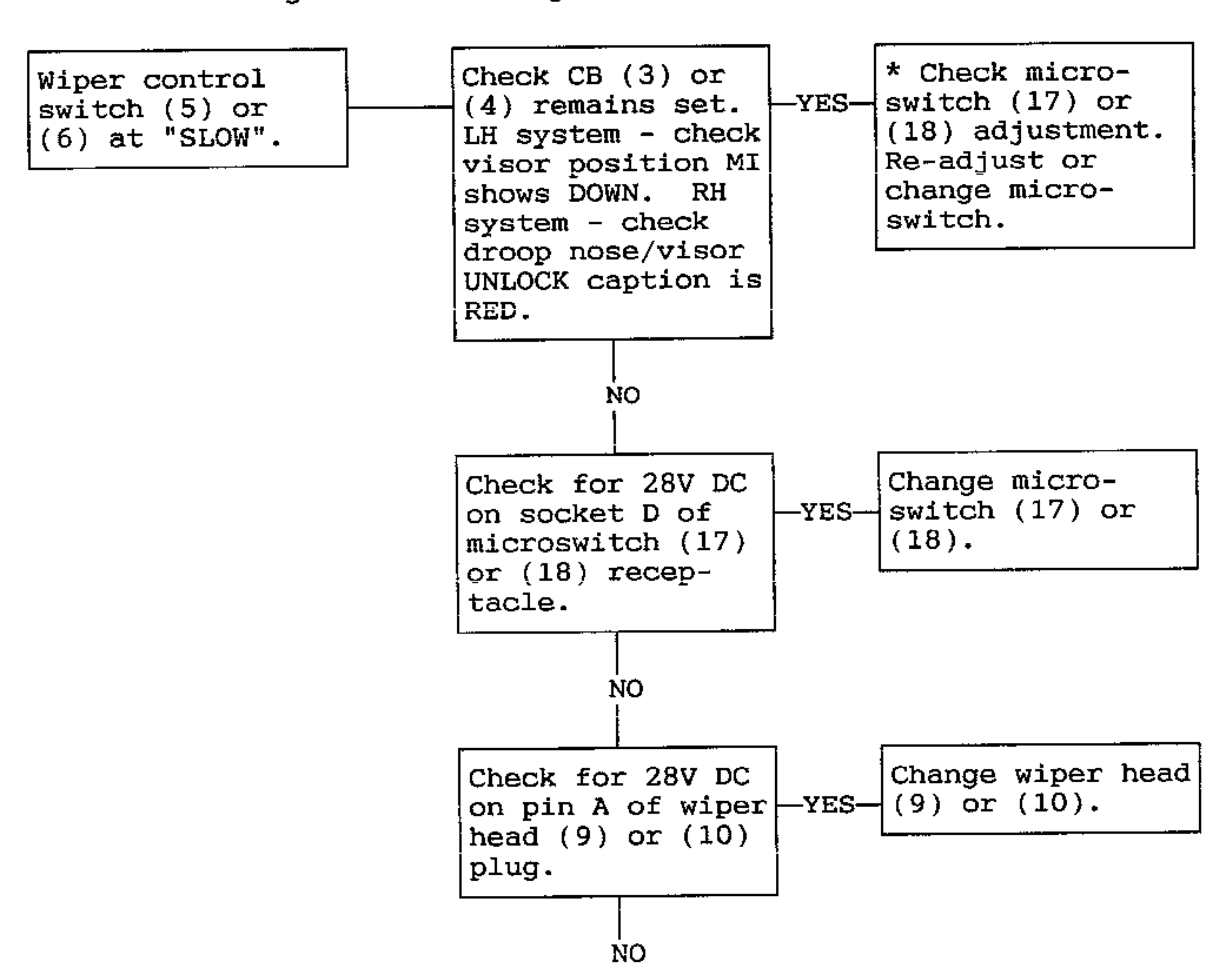


Chart 101 (continued)

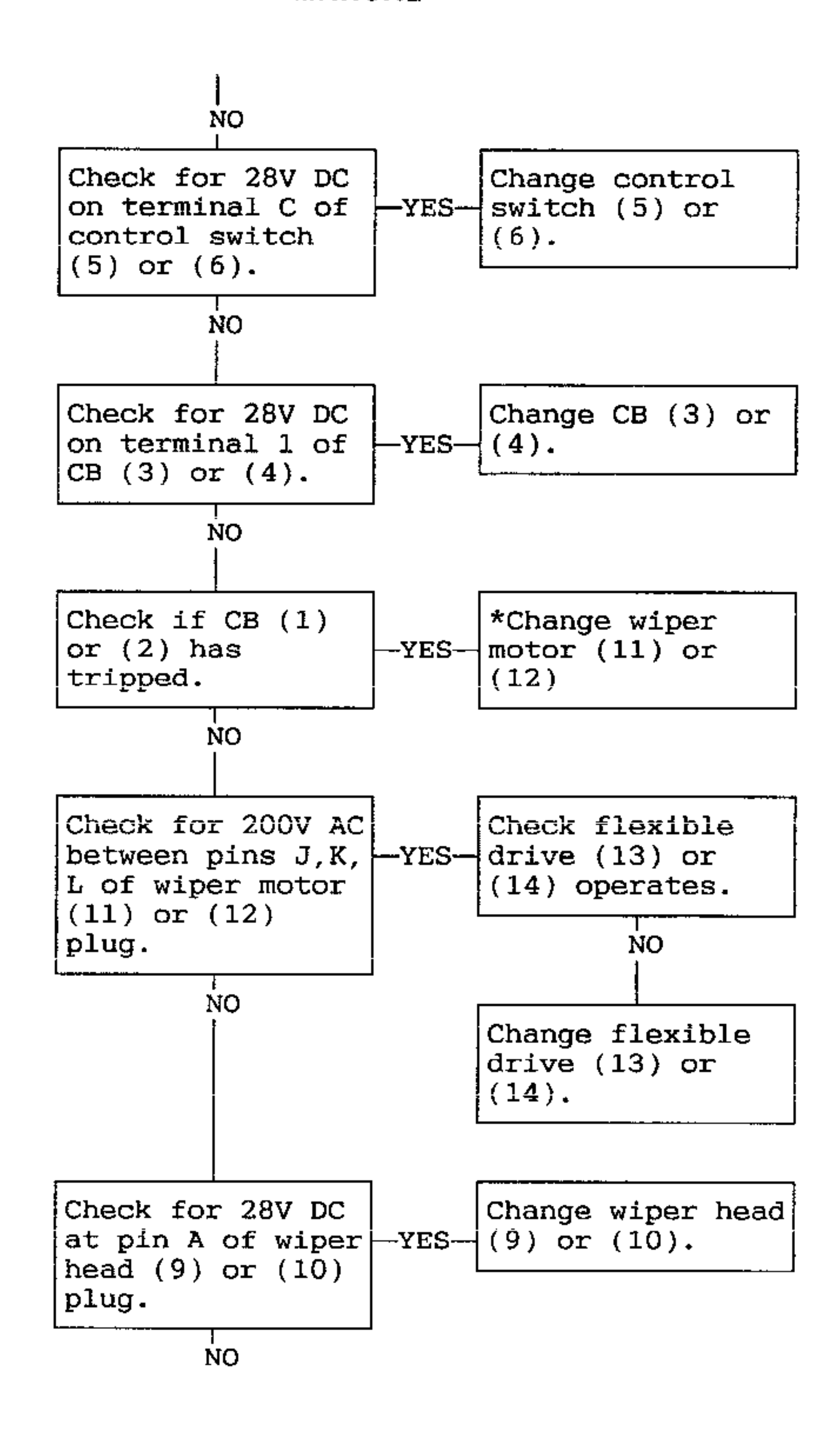
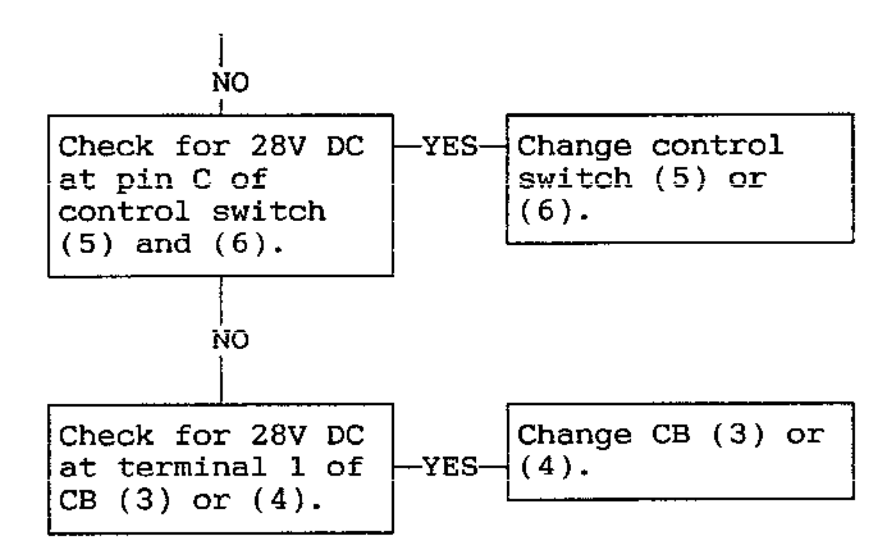


Chart 101 (continued)



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Chart 101 (concluded)

```
********************************
*W/S WIPER CONTINUES TO SWEEP *
*AT SLOW RATE WHEN SWITCHED TO*
*"FAST".                      *
********************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLY 200V 3 PHASE	-
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-

NOTE: Before renewal of components (*), check the preceding run of wiring for continuity.

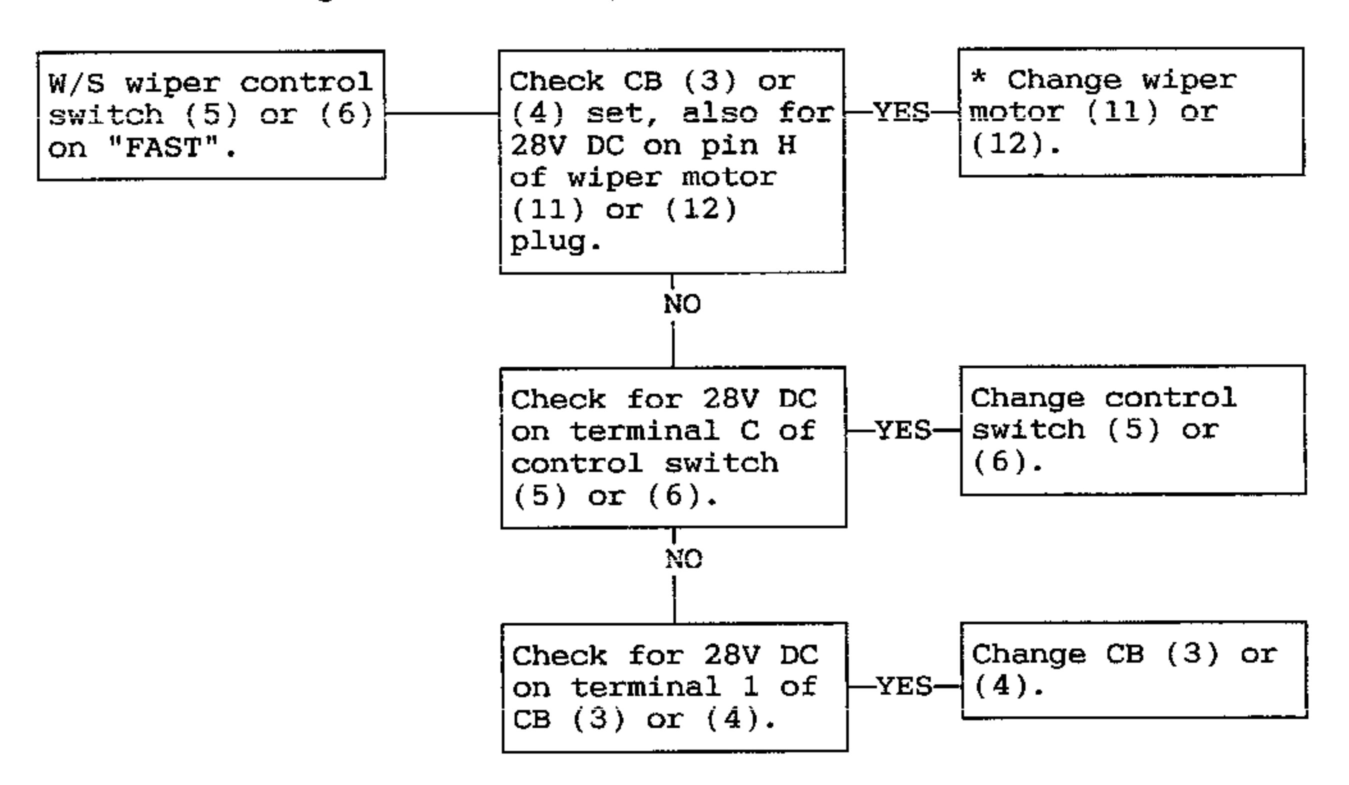


Chart 102

```
*******************************
*W/S WIPER DOES NOT PARK WHEN *
*"EMERG PARK" SELECTED.       *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
POWER SUPPLY 200V 3 PHASE	-
MULTIMETER	-
CIRCUIT BREAKER SAFETY CLIPS	-

NOTE: Before renewal of components (*), check the preceding run of wiring for continuity.

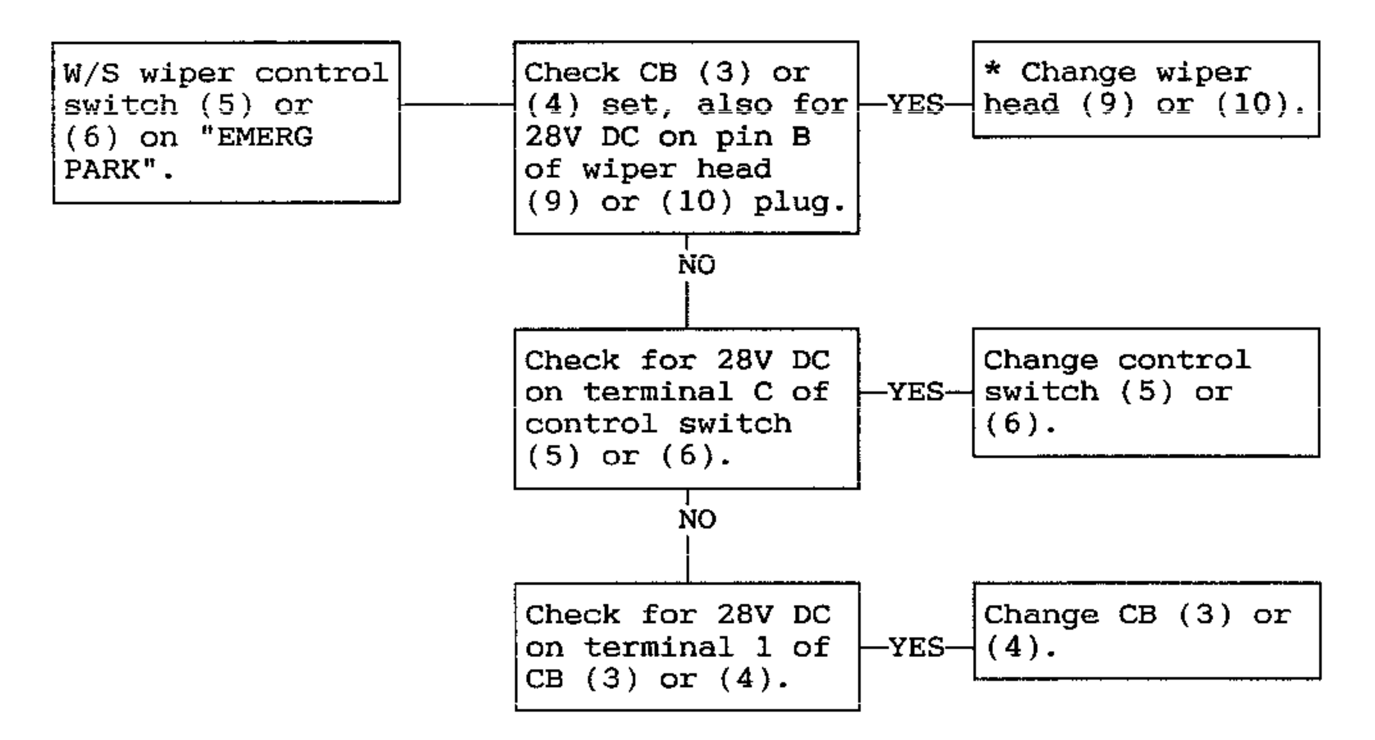


Chart 103

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(1) Circuit Breaker 200V	-	2-213	1H71	Map ref.E23	24-50-00	24-51-21
(2) Circuit Breaker 200V	-	14-216	2H71	Map ref.D15	24-50-00	24-51-14
(3) Circuit Breaker 28V	-	1-213	1H72	Map ref.J8	24-50-00	24-52-15
(4) Circuit Breaker 28V	-	15-216	2H72	Map ref.A15	24-50-00	24-52-12
(5) Control Switch LH	-	9-211-3	1H75	Aft centre console	30-42-00	30-42-01
(6) Control Switch RH	-	9-211-3	2H75	Aft centre console	30-42-00	30-42-01
(7) Wiper Arm LH	-	113	-	On LH windshield	30-42-14	-
(8) Wiper Arm RH	-	114	-	On RH windshield	30-42-14	-
(9) Wiper Head LH	-	113	1H76	Below LH windshield	30-42-11	30-42-01
(10) Wiper Head RH	-	114	2H76	Below RH windshield	30-42-11	30-42-01
(11) Wiper Motor LH	On furn-ishing trim	211	1H74	Below LH side window	30-42-12	30-42-01
(12) Wiper Motor RH	On furn-ishing trim	212	2H74	Below RH side window	30-42-12	30-42-01
(13) Flexible Shaft LH	-	113	-	Below LH side window/ windshield	30-42-13	

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(14) Flexible Drive shaft RH	-	114	-	Below RH side window/ windshield	30-42-13	-
(15) Visor down indicator	-	2-212-6	M38	RH dash panel	27-61-00	-
(16) 3-caption indicator	-	2-212-6	M59	RH dash panel	27-61-00	-
(17) Visor down micro-switch LH	113BB	113	M60	Droop nose	27-61-26	-
(18) Visor down micro-switch RH	113BB	113	M34	Droop nose	27-61-26	-

Component Identification
Table 101

RAIN DISPERSAL SYSTEM - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

CAUTION: ELECTROLUMINESCENT PANELS ARE FRAGILE. HANDLE THEM WITH CARE.

1. General

This topic contains general instructions for the removal and installation of electrical switches and relays, fitted to the centre and the RH side consoles. Detailed instructions for the removal and installation of major components are given separately under individual subject numbers.

Two rotary switches for the control of the LH and RH windshield wipers are mounted on the aft centre console, sub-panel 9-211-3.

For some components it is necessary to remove the associated electroluminescent panel (Ref. Chapter 33). The panels are electrically connected by flying leads or terminal connections at the back of the panel.

Special tools may be required such as thin walled tubular hexagon or peg spanners for switches, cruciform (straight and offset) screwdrivers for magnetic indicators and cable insertion/extraction tools for various cable sizes on components fitted with 'pin' type connectors.

Unlocked bolts are to be assembled using Loctite Grade H, together with Locquic 'N' activator, (Ref. 20-25-11).

2. Aft Centre Console, Sub-panel 9-211-3, Components
(Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Screwdriver torque limiting range: 0-79 lbf in (0-0.89 mdaN)	-
Corrosion resistant steel wire 0.028 in (0.71 mm) dia.	-
Locking pin (droop nose)	E925045031
Loctite grade H (Ref. 20-30-00, No.113)	-
Locquic N activator to DTD 900/4588 (Ref. 20-30-00, No.120)	-

B. Prepare to Remove Components

(1) Electrically isolate the sub-panel by tripping the associated circuit breakers, fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH W/SCREEN WIPER CONT	1-213	1H 72	J 8
NOSE 7 1/2° CONT		M 12	Q16
NOSE/VISOR STBY LOWER SUP		M 13	Q17
LH W/SCREEN WIPER SUP	2-213	1H 71	E23
CTR CONSOLE PNL LTG SUP	13-215	L 82	B12
RH W/SCREEN WIPER SUP	14-216	2H 71	D15
VISOR & NOSE CONT	15-215	M 11	F 8
RH W/SCREEN WIPER CONT	15-216	2H 72	A15
CHART STOWAGE LTS SUP		L 237	D12

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG. 1			
MAIN THROT CONT	3-213	1K 3	A 1
REV THRUST CONT		1K 331	D 1
REV THRUST ASOV CONT		1K 334	G 3
PP MTG LTS SUP	5-213	1E 461	D 1
ALTN THROT CONT	15-216	1K 4	E 8
REHEAT CONT		1K1542	E 9
ENG. 2			
MAIN THROT CONT	1-213	2K 3	A 3
REV THRUST CONT		2K 331	B 5
REV THRUST ASOV CONT		2K 334	D 7
PP MTG LTS SUP		2E 461	E 3
REHEAT CONT	15-215	2K1542	D15
ALTN THROT CONT		2K 4	F15
ENG. 3			
MAIN THROT CONT	1-213	3K 3	A 4
REV THRUST CONT		3K 331	B 6
REV THRUST ASOV CONT		3K 334	D 8
PP MTG LTS SUP		3E 461	E 4
REHEAT CONT	15-215	3K1542	D16
ALTN THROT CONT		3K 4	F16
ENG. 4			
MAIN THROT CONT	3-213	4K 3	A 2
REV THRUST CONT		4K 331	D 2
REV THRUST ASOV CONT		4K 334	G 4
PP MTG LTS SUP	5-213	4E 461	D 2
REHEAT CONT	15-216	4K1542	E10
ALTN THROT CONT		4K 4	F 9

(2) Remove the centre console aft left-hand side panel:

NOTE: To improve access to the centre console it may be necessary to remove the co-pilot's seat (Ref. 25-11-21, Removal/Installation).

(a) Release the screws securing the panel.

(b) Disconnect the electrical plug for the pilots' floor illumination at the receptacle identified U2026 on the panel.

(c) Remove the panel.

(3) Remove the droop nose emergency lever.

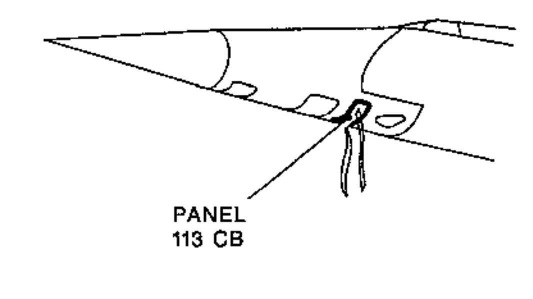
NOTE: This can be done with the nose either up or down.

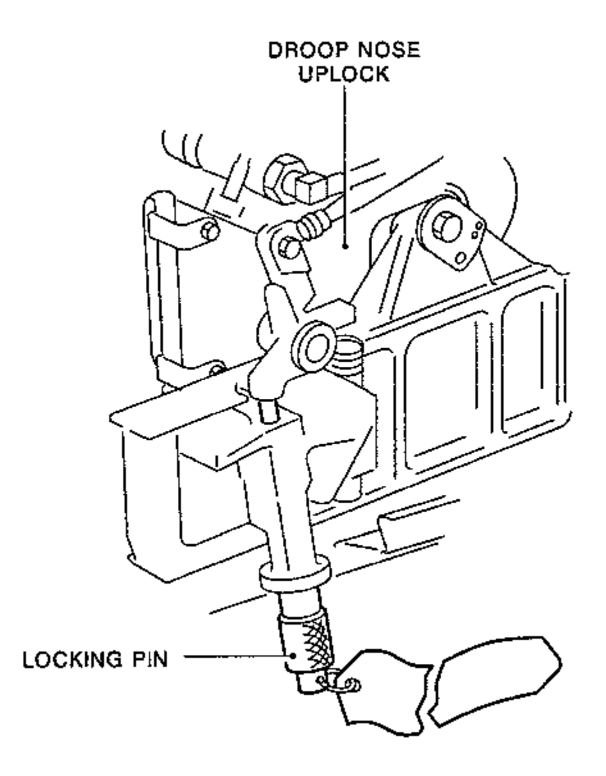
(a) If the nose is up, fit locking pins to the droop nose uplocks (Ref. Fig. 401).

R

(b) Using the ring pull the handle outwards at the aft end of the droop nose emergency lever.

(c) Reach through the centre console from the left-hand side and depress the spring-loaded pin on the cross shaft of the droop nose emergency lever. Remove the lever and cross shaft assembly.





CMB 30 42 00 4 AAM0 00

Droop Nose Locking Pins
Figure 401

(4) Remove the centre console aft right-hand side panel in a manner similar to that described for the left-hand. The electrical plug identification is U2025.

(5) Remove the protective cover from beneath sub-panel 9-211-3 (Ref. Fig. 403):

(a) Disconnect the baulk override lever by removing the bolt assembly.

(b) Remove the three screws securing the cover to the underside of the panel and lower the cover.

(c) Disconnect the electrical plug from the cover and remove the cover.

C. Remove Rotary Switch (Electrical Code 1H75, 2H75)

(1) Release the flying leads from the loom ties and, using a suitable tool, withdraw the pin inserts from the module block.

(2) Remove the cap from the end of the switch knob, loosen the collet nut and withdraw the knob from the switch spindle.

(3) Using a tubular spanner, remove the nut washer and locking washer from the front of the panel and withdraw the switch from the rear.

D. Install Rotary Switch (Electrical Code 1H75, 2H75)

(1) Comply with the electrical safety precautions.

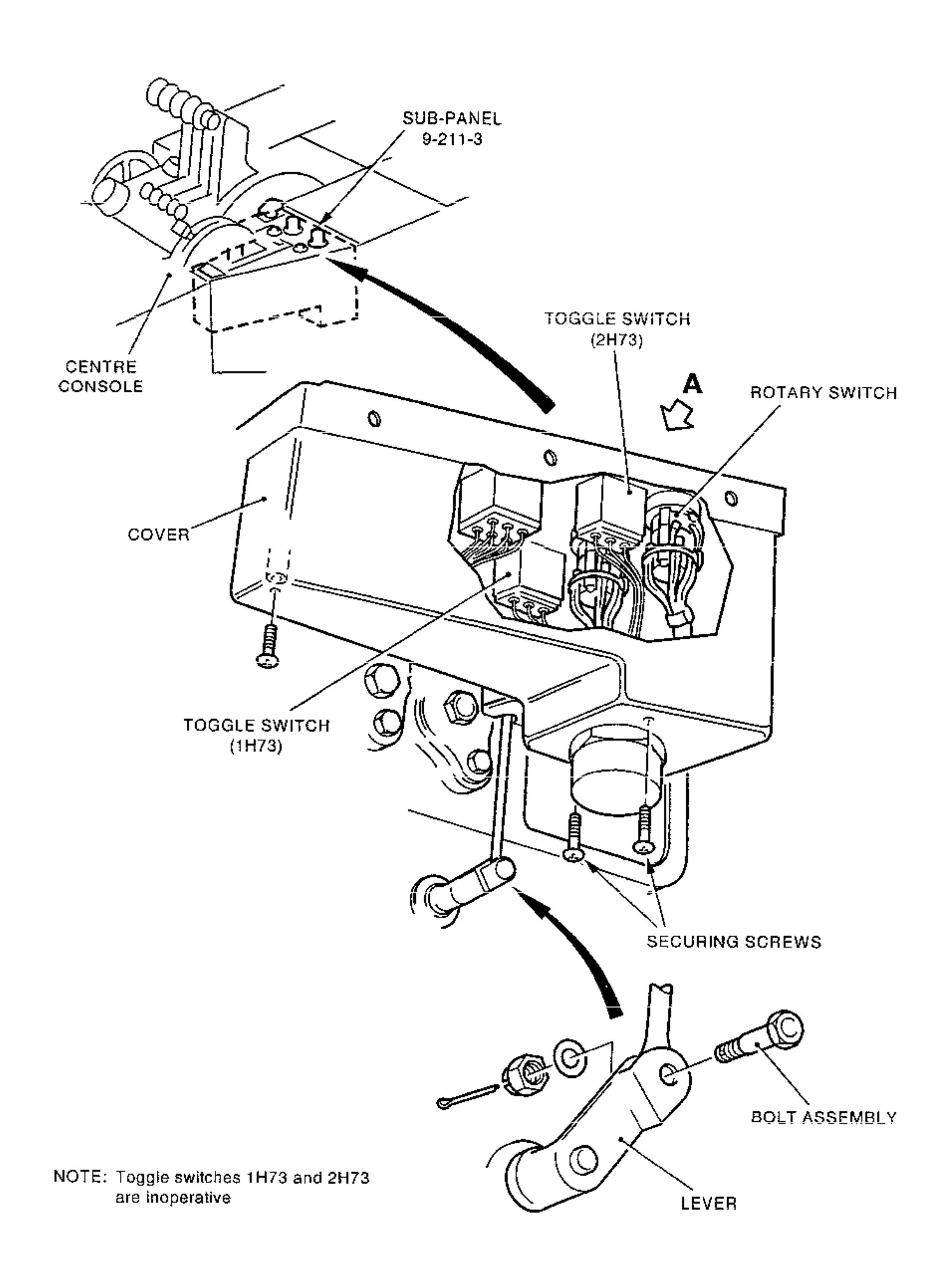
(2) Insert the switch through the aperture from the rear of the panel, ensuring that the locating spigot engages the locating hole in the panel.

(3) Secure the switch with the nut and washer.

(4) Fit the knob on the switch spindle, ensuring that the spindle spigot is engaged with the slot in the knob. Tighten the collet nut and fit the end cap.

(5) Using a suitable tool, connect the flying leads to the module block, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

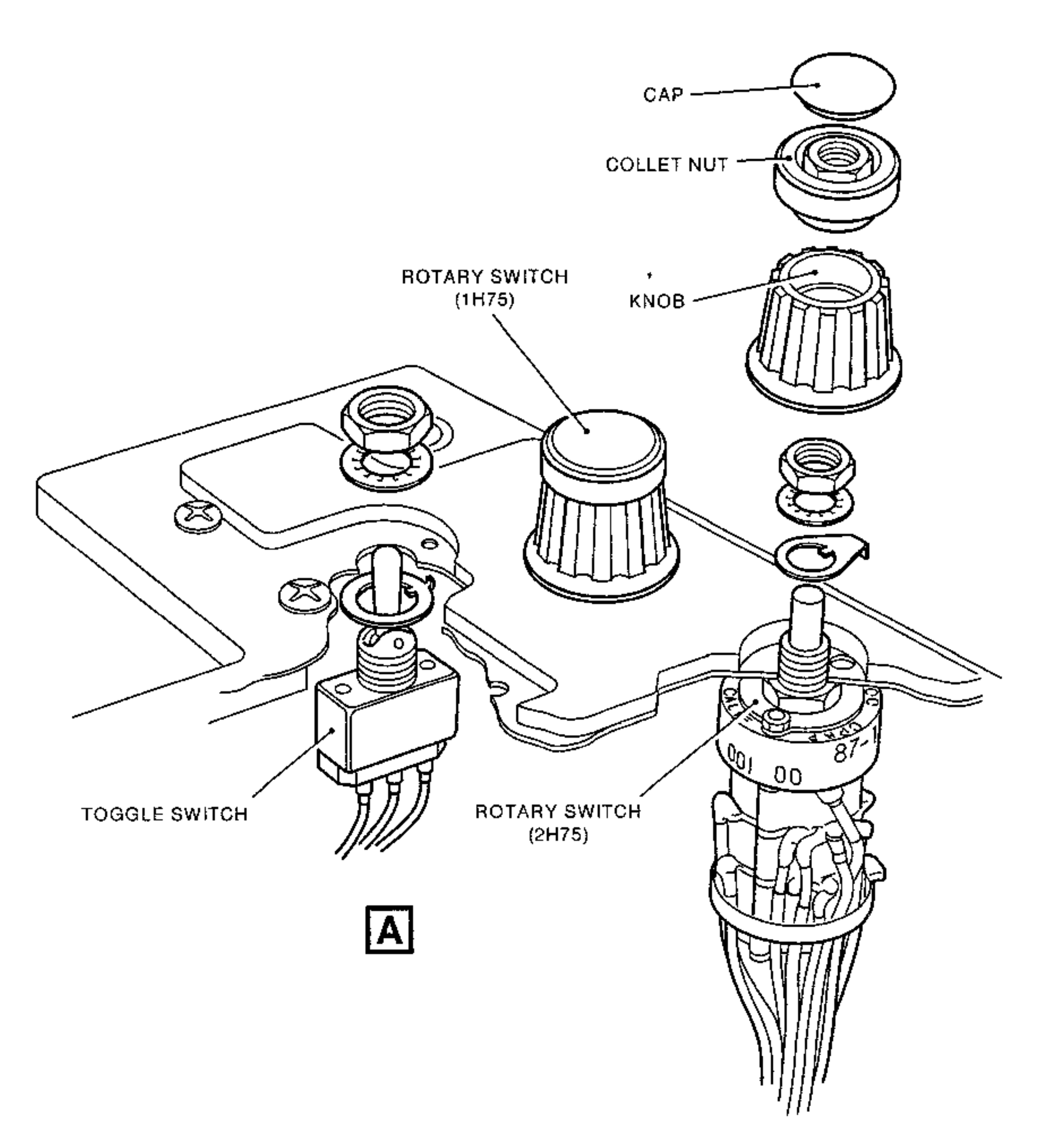
(6) Secure the flying leads to the cable loom with suitable ties in accordance with 20-27-15.



NOTE: Toggle switches 1H73 and 2H73 are inoperative

CMB 30 42 00 4 ACMA 00

Centre Console, Sub-Panel 9-211-3, Switch Installation (Sheet 1 of 2)
Figure 402



NOTE: Toggle switches are inoperative

CMB 30 42 00 4 ACMM 00

Centre Console, Sub-Panel 9-211-3, Switch Installation (Sheet 2 of 2)
Figure 402

E. Conclude Installation

(1) Refit the protective cover beneath sub-panel 9-211-3 (Ref. Fig. 402).

(a) Connect the electrical plug to the cover.

(b) Fit the cover to the underside of the panel and secure it with the three screws. Lock the screws with Loctite grade H (Ref. 20-25-11).

(c) Connect the baulk override lever using the bolt assembly, and carry out the setting-up procedure given in 76-11-24.

(2) Replace the centre console aft right-hand side panel:

(a) Check the panel seals for damage and security.

(b) Loosely engage the panel.

(c) Connect the pilots' floor illuminations at the receptacle identified U2025 on the panel.

(d) Torque tighten the panel screws to between 40 and 45 lbf in (0.44 and 0.51 mdaN).

(3) Fit the droop nose emergency release lever on the right-hand side of the centre console and insert the quick-release pin.

(4) Secure the centre console aft left-hand side panel in a manner similar to that described for the right-hand panel. The electrical plug is identified U2026.

(5) If necessary, replace the co-pilots' seat (Ref. 25-12-21, Removal/Installation).

(6) Remove the locking pins from the droop nose.

(7) Remove the safety clips and reset the circuit breakers previously tripped in operation 3.B.(1).

(8) Carry out operational tests on the services from sub-panel 3:

(a) Visor and droop nose standby system (Ref. 27-61-00).

(b) Windscreen wipers (Ref. 30-42-00).

RAIN DISPERSAL SYSTEM - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN CHAPTER 24-00-00.

1. General

These adjustments and tests cover the windshield wiper systems and apply to both the LH and RH systems, which are independently operated. The visor and droop nose must be fully lowered and locked and the associated circuit breaker tripped before attempting to carry out the test and adjustment procedures. Testing of the windshield override switch is detailed in 27-61-00, Adjustment/Test.

2. Functional Test - Windshield Wiper System

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking sleeves	E925091000
Spring balance (Calibrated from 0-20 lb 0-9.07 kg)	-
Cloth (lint-free)	-
Clean water supply	-
Chamois leathers	-
Corrosion resistant steel wire 0.31 in (0.8 mm) dia.	DTD189

B. Prepare to Test (Ref. Fig. 501)

(1) Make available electrical ground power (Ref. 24-41-00, Servicing).

(2) Fully lower the visor and the droop nose (Ref. 27-61-00, Adjustment/Test).

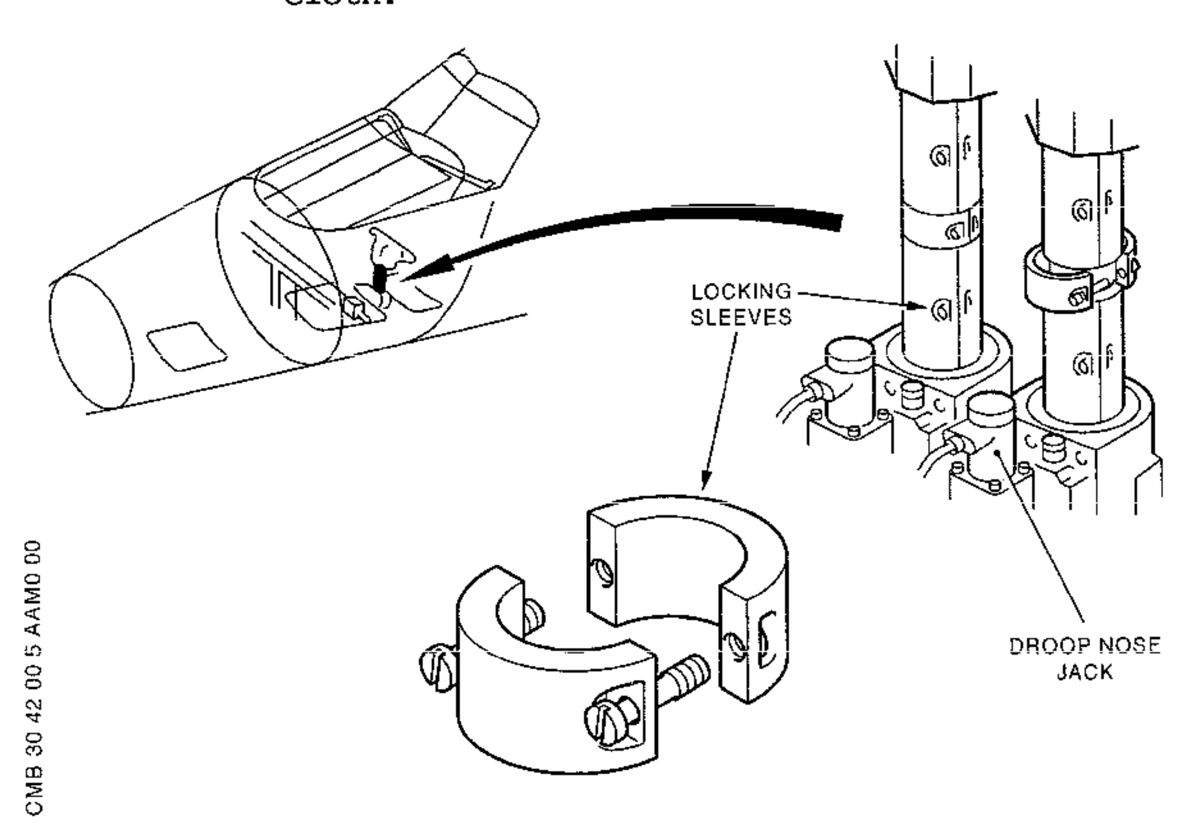
(3) Trip the circuit breakers associated with the visor and droop nose, and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
NOSE 7 1/2 DEG CONT	1-213	M 12	Q16
NOSE/VISOR STBY LOWER SUP		M 13	Q17
VISOR AND NOSE CONT	15-215	M 11	F 8

(4) Place a warning placard on the visor and droop nose section of the pilots dash panel indicating that the visor and droop nose must not be operated.

(5) Remove the access panel 113DB, and fit the locking sleeves to the droop nose actuator (Ref. Fig. 501).

(6) Clean each windshield with water, using a lint-free cloth.



Safety Equipment
Figure 501

C. Test Windshield Wiper System

CAUTION: WHEN THE WINDSHIELD WIPERS ARE OPERATED FOR TEST PURPOSES THE WINDSHIELDS MUST BE CONTINUOUSLY LUBRICATED WITH WATER.

(1) Turn the W/S WIPER control switch from "OFF" to "SLOW". Check that the actuating arm moves from its parked position on the windshield, and sweeps the windshield at 75 cycles per minute.

NOTE: One cycle is a sweep of the windshield and back to the start position.

(2) Check that the angle of sweep of the actuating arm gives a swept area of the windshield between 85 and 90 deg and that the arm does not over-run the edge of the windshield.

(3) Turn the W/S WIPER control switch from "SLOW" to "FAST". Check that the actuating arm increases its speed of sweep to 150 cycles per minute, and that the angle of sweep is between 85 and 90 deg.

(4) Trip the appropriate wiper supply circuit breaker (LH system circuit breaker 1H71 on panel 2-213 map ref. E23, RH system circuit breaker 2H71 on panel 14-216 map ref. D15) to stop the wiper blade on the windshield above the MAX PARKING POSITION (20 deg from the start of sweep).

(5) Turn the wiper switch to "EMERG PARK" and check that the wiper actuating arm moves to a parked position below 20 deg.

NOTE: Red marks are painted on the centre pillar between the windshields, and on adjacent windshields, indicating the top limits of the emergency park area (Ref. 11-33-00).

(6) Reset the wiper supply circuit breaker and turn the wiper switch to "SLOW". Allow the wiper to move across the windshield several times then turn the wiper switch to "OFF". Check that the arm parks at the bottom of its stroke, on the windshield (Ref. Fig. 502).

(7) Check the pressure of each windshield wiper blade on the windshield:

(a) Turn the W/S WIPER speed control to "SLOW". Stop the wiper when the actuating arm has reached the centre of its arc of travel, by tripping the associated circuit breaker (LH system circuit breaker 1H71 on panel 2-213 map ref. E23, RH system circuit breaker 2H71 on panel 14-216 map ref. D15).

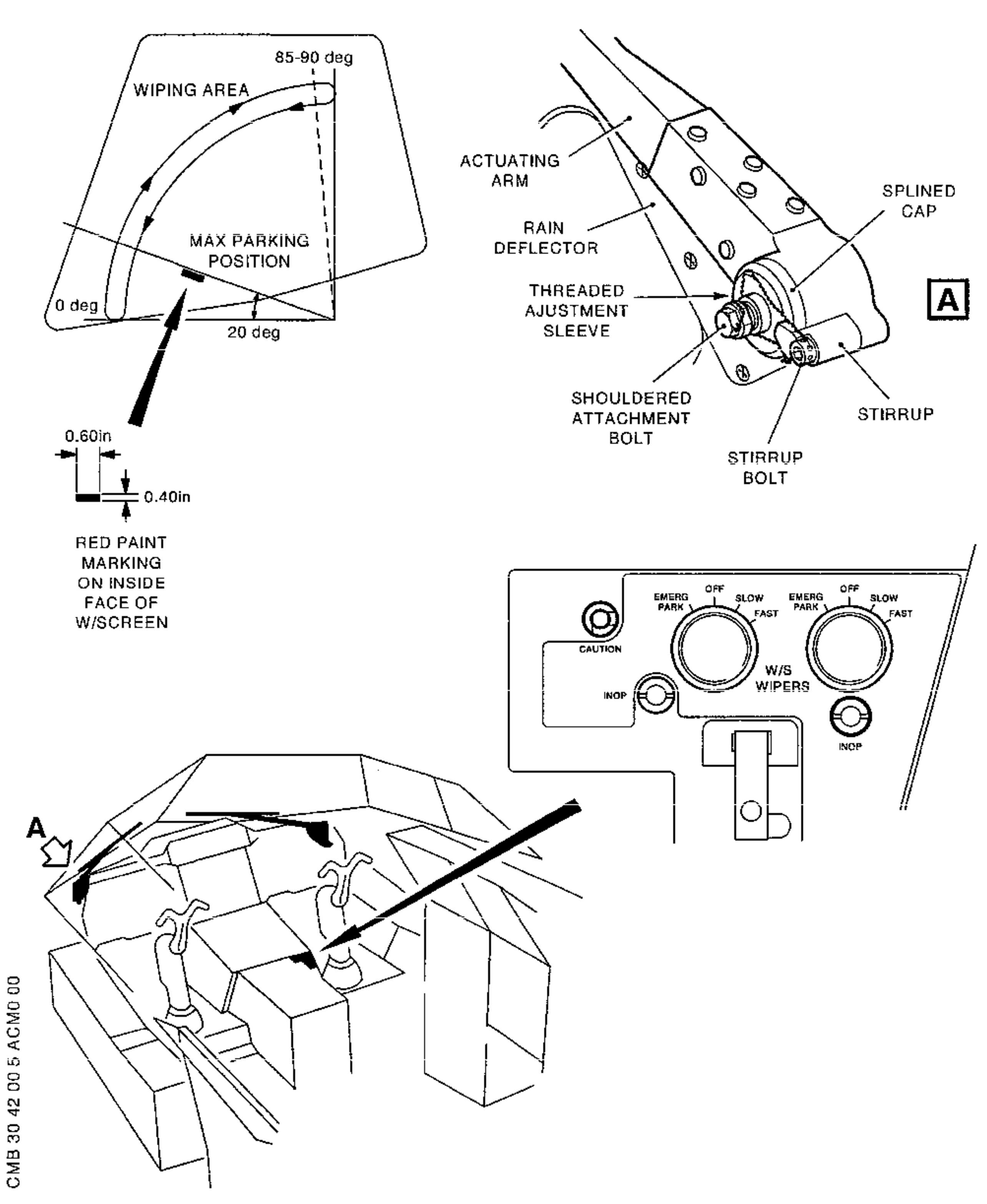
(b) Attach a spring balance to the actuating arm at the wiper blade attachment point. Hold the spring balance perpendicular to the windshield and exert a steady pull on it, when a gap of 0.003 to 0.005 in (0.0762 to 0.1270 mm) between the centre of the wiper blade and the windshield appears note the spring balance reading. The spring balance should indicate between 12 and 20 lbf (5.44 and 9.07 kg). If necessary, adjust the wiper blade pressure, as follows:

(b1) Trip the associated circuit breaker (LH system circuit breaker 1H71 on panel 2-213 map ref. E23, RH system circuit breaker 2H71 on panel 14-261 map ref. D15).

(b2) To increase the blade pressure on the windshield, cut the locking wire on the shouldered attachment bolt, threaded sleeve and stirrup bolt. Holding the shouldered attachment bolt, progressively screw in the threaded sleeve to obtain the correct blade pressure.

(b3) To decrease the blade pressure on the windshield, cut the locking wire on the shouldered attachment bolt, threaded sleeve and stirrup bolt. Release the attachment bolt two turns, and remove the stirrup and bolt. Protect the aircraft skin where the stirrup bolt will contact it, with a piece of suitable material. Turn the bolt to impinge on the protective material, continue turning the screw to decrease the blade pressure on the windshield. Remove the bolt and protective material, replace the stirrup and bolt. Tighten the shouldered attachment bolt.

(b4) Recheck that the blade pressure is correct.



Rain Dispersal System - Adjustment/Test
Figure 502

(b5) When the required pressure has been obtained, lock the shouldered attachment bolt, threaded sleeve and the stirrup bolt with 0.031 in (0.8 mm) dia. corrosion resistant steel wire.

(c) Reset the wiper supply circuit breaker and turn the wiper switch to "SLOW". Allow the wiper to move across the windshield several times then turn the wiper switch to "OFF". Check that the wiper arm parks at the bottom of its stroke, on the bottom of the windshield (Ref. Fig. 502).

(d) Repeat operation (7)(a) and (b) at the high and low wiper sweep positions. At the high position, blade pressure may be between 12 and 20 lbf (5.44 and 9.07 kg) to account for variations in actuating arm/glazing squareness. At the low position, blade pressure must not exceed 18 lbf (8.16 kg).

(8) Clean each windshield using a chamois leather and clean water. The chamois leather must be free of all abrasive material. Polish the windshield with a clean, dry, lint-free cloth.

D. Conclusion

(1) Remove the locking sleeves from the droop nose actuator jacks.

(2) Refit and secure access panel 113DB (Ref. Fig. 501).

(3) Remove the warning placard from the pilot's dash panel and check that the VISOR/NOSE selector switch is at the "DOWN" position.

(4) Remove the safety clips and reset the circuit breakers previously tripped.

(5) Switch off and disconnect the electrical ground power (Ref. 24-41-00, Servicing).

3. Functional Test - Windshield Wiper System (Partial)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking pins (2) droop nose up	E92045031
Clean water supply	-
Chamois leather	-
Cloth (lint-free)	-

B. Prepare to Test (Ref. Fig. 501)

(1) Remove access panel 113CB and fit the droop nose up locking pins in the nose uplocks.

(2) Make available electrical ground power (Ref. 24-41-00, Servicing).

(3) Fully lower the visor (Ref. 27-61-00, Adjustment/Test).

(4) Trip the circuit breakers associated with the visor and droop nose and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
NOSE 7 1/2 DEG CONT	1-213	M 12	Q16
NOSE/VISOR STBY LOWER SUP		M 13	Q17
VISOR AND NOSE CONT	15-215	M 11	F 8

(5) Place a warning placard on the visor and droop nose section of the pilot's dash panel indicating that the visor and droop nose must not be operated.

(6) Clean each windshield with water, using a lint-free cloth.

C. Test Windshield Wiper System

CAUTION: WHEN THE WINDSHIELD WIPERS ARE OPERATED FOR TEST PURPOSES THE WINDSHIELDS MUST BE LUBRICATED WITH WATER CONTINUOUSLY.

NOTE: Operations (1) to (4) are to be satisfactorily completed for left and right hand wiper systems.

(1) Turn the W/S WIPER control switch from "OFF" to "SLOW". Check that the wiper moves from its parked position and sweeps the windshield.

(2) After the wiper has moved across the windshield several times, turn the W/S WIPER control switch from "SLOW" to "FAST". Check that the speed of the wiper increases.

(3) Allow the wiper to move across the windshield several times and then turn the W/S WIPER control switch to "OFF". Check that the arm parks at the bottom of its stroke, on the windshield.

(4) Clean each windshield using a chamois leather and clean water. The chamois leather must be free of all abrasive material. Polish the windshield with a clean, dry, lint-free cloth.

D. Conclusion

(1) Remove the locking pins from the droop nose uplocks.

(2) Refit and secure access panel 113CB.

(3) Remove the warning placard from the visor and droop nose section of the pilot's dash panel and check that the VISOR/NOSE selector switch is at the "VIS/O" deg position.

(4) Remove the circuit breaker safety clips and reset the circuit breakers previously tripped.

(5) Switch off and disconnect the electrical ground power (Ref. 24-41-00, Servicing).

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RAIN DISPERSAL SYSTEM - INSPECTION/CHECK

1. General

For this Inspection/Check it is necessary that the visor is lowered, but the droop nose may be either raised or lowered. Ground equipment must be fitted to prevent movement of the nose or visor.

2. Inspection/Check

A. Equipment and Materials

DESCRIPTION	PART NO.
Visor, down locking link	D925468030
Droop nose, up locking pins	E925045031
Droop nose, down locking sleeves	E925091000
Circuit breaker safety clips	-

B. Preparation

(1) Make available ground electrical power (Ref. 24-41-00, Servicing).

(2) Lower the visor (Ref. 27-61-00, Adjustment/Test) and fit the ground locking equipment to both the visor and the droop nose.

(3) Trip the following circuit breakers and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
NOSE 7 1/2 DEG CONT	1-213	M 12	Q16
NOSE/VISOR STBY LOWER CONT		M 13	Q17
VISOR & NOSE CONT	15-215	M 11	F 8

(4) Place a warning placard on the visor/droop nose selector, on the pilot's dash panel, indicating that the visor and droop nose must not be operated.

C. Internal Examination

(1) With the W/S wiper rotary selector switches on the pilots' centre console at "OFF". Observe that the windshield wipers are contacting the windshield at the bottom of their stroke.

R
R (2) Ensure that the windshield wipers parking reference marks on the windshield and centre pillar are intact (Ref. 11-33-00).

D. External Examination

(1) Visually inspect all components on the windshield for corrosion, damage and security of attachment.

(2) Check that the locking wire securing the protruding screwed spindle to the locknut, the locknut to the jacking screw, and the jacking screw to the splined seal cover is intact on both windshield wipers.

R

END OF THIS SECTION

NEXT

WINDSHIELD WIPER HEAD - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

R

R NOTE: The rain repellent fluid system has been rendered
R inoperative.

1. General

Two wiper heads are fitted to the aircraft, one to each windshield and the Removal/Installation instructions are identical for the right and left-hand. The wiper heads are bolted to the aircraft structure immediately below each windshield, and drive the actuating arms.

The visor and droop nose must be fully lowered, and the droop nose locked before attempting a removal or installation of the wiper head.

2. Wiper Head (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking Sleeve	E925091000
Torque spanner (0 to 120 lbf in, 0.0 to 1.36 mdaN range)	-
Ardrox 6025 t (Made from 3 parts 6025AF, Ref. 20-30-00, No.455 and 7 parts Kerosene)	-

R

B. Prepare to Remove Wiper Head

(1) Make available electrical ground power (Ref. 24-41-00, Servicing).

(2) Fully lower the visor and droop nose (Ref. 27-61-00).

(3) Trip the circuit breakers associated with the visor, droop nose, and rain dispersal system and secure them in position with safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH W/SCREEN WIPER CONT	1-213	1H 72	J 8
NOSE 7 1/2 DEG CONT		M 12	Q16
NOSE/VISOR ST'BY LOWER SUP		M 13	Q17
LH W/SCREEN WIPER SUP	2-213	1H 71	E23
RH W/SCREEN WIPER SUP	14-216	2H 71	D15
RH W/SCREEN WIPER CONT	15-216	2H 72	A15
VISOR AND NOSE CONT		M 11	F 8

R

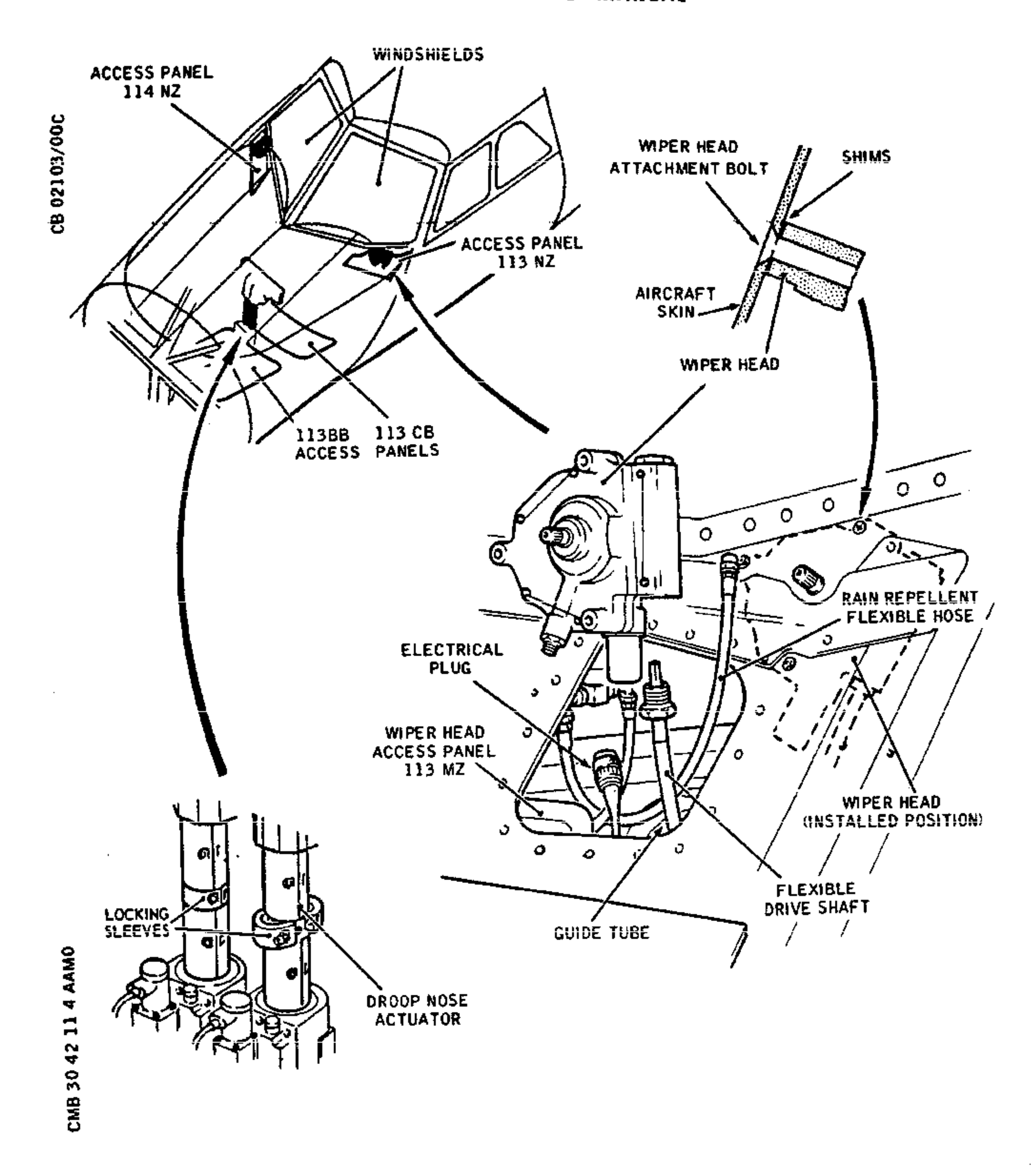
(4) Place a warning placard on the visor/droop nose selector on the pilots' dash panel indicating that the visor and droop nose must not be operated.

(5) Remove the access panel 113DB, and fit the locking sleeve of the droop nose actuator.

(6) Remove the wiper actuating arm (Ref. 30-42-14, Removal/Installation).

(7) Remove the countersunk screws securing the panels 113NZ or 114NZ. Remove the panel. (Ref. Fig. 401).

(8) Remove the countersunk screws securing the wiper head access panel. Remove the panel which abuts the inner side of the aircraft structure, to which it is attached by a terylene cord.



Windshield Wiper Head - Installation
Figure 401

C. Removal

CAUTION: WHEN THE WINDSHIELD WIPERS ARE OPERATED FOR MAINTENANCE PURPOSES THE WINDSHIELD MUST BE LUBRICATED WITH WATER.

(1) Disconnect the electrical plug from the wiper head.

(2) Unscrew the rain repellent flexible hose union from the wiper head.

(3) Cut the locking wire securing the flexible drive shaft union to the wiper head. Unscrew the union and retain the ferrule (Ref. Fig. 401).

CAUTION: PHOSPHOR BRONZE FERRULES ARE FITTED TO BOTH ENDS OF THE FLEXIBLE DRIVE SHAFT. THESE FERRULES ARE NOT ATTACHED TO ANY COMPONENT THEREFORE CARE MUST BE TAKEN TO ENSURE THEY ARE NOT DROPPED INTO THE AIRCRAFT STRUCTURE DURING THE REMOVAL/INSTALLATION OF THE FLEXIBLE DRIVE SHAFT.

(4) Tape the flexible shaft union to the end of the shaft so that the union cannot slide down the shaft onto the guide tube.

(5) Support the wiper head, remove the three countersunk wiper head attachment bolts and distance piece and retain.

NOTE: A distance piece is fitted with the lower of the three countersunk bolts and fits between the internal face of the bulkhead and the wiper head.

(6) Withdraw the flexible drive shaft from the wiper head.

(7) Manipulate the wiper head out through the access hole.

D. Installation

(1) If a replacement wiper head is to be fitted, remove the rain repellent adaptor from the head and fit it to the replacement head. Torque-load the adaptor to between 107 and 117 lbf in (1.21 and 1.32 mdaN).

(2) Comply with the electrical safety precautions.

(3) Ensure that the locking sleeve is fitted to the droop nose actuator.

(4) Manipulate the wiper head through the access hole.

(5) Remove the tape securing the flexible drive union and ensure that the union does not slide down the shaft. Fit the end of the shaft into the wiper head, ensuring that the squared end of the ferrule engages on the square end in the wiper head. Secure the shaft by securing the union and torque-load to between 18 and 22 lbf in (0.203 and 0.248 mdaN). Lock the union with wire, to the wiper head.

(6) Fit the rain repellent hose union to the wiper head.

(7) Secure the wiper head to the aircraft structure with the three bolts and the distance piece. Torque-load the bolts to between 70 and 80 lbf in (0.79 and 0.90 mdaN).

(8) Torque-load the rain repellent union to between 70 and 120 lbf in (0.79 and 1.36 mdaN) and lock it with wire to the wiper head.

(9) Ensure that the electrical plug and receptacle are clean and undamaged. Connect the plug to the wiper head.

(10) Using the four lower bolts, secure the wiper head access panel.

(11) Secure the panels 113 NZ or 114 NZ, as applicable.

R
R (12) Install the windshield wiper actuating arm (Ref. 30-42-14, Removal/Installation).

R (13) Remove the safety clips from the following circuit breakers:

WINDSHIELD WIPER MOTOR - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

R 1. General (Ref. Fig. 401)

The motor which incorporates a reduction gear, is located on a saddle block behind an access panel in the furnishing trim below the flight compartment side window, The saddle block allows adjustment of the motor position.

2. Windshield Wiper Motor

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Torque spanner 0 to 35 lb in (0 to 0.395 mdaN) range	-

B. Prepare

(1) Trip the circuit breakers associated with the motor to be removed and the switch panel attached to the panel 211PS and/or 212PS.

R
R
R
R

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
LH SIDE			
LH W/SCREEN WIPER SUP	2-213	1H71	E23
LH W/SCREEN WIPER CONT	1-213	1H72	J 8
LH DASH INST LTS SUP	13-215	L372	A12
LH DASH & CTR FLOODS SUP	1-213	L234	M22
CHARTS STOWAGE LTS SUP	15-216	L237	D12
PLT's LT TEST SUP	15-215	L1001	E14

R

R
R
R

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
STBY MAG COMPASS LT SUP	1-213	L380	P22
RH SIDE			
RH W/SCREEN WIPER SUP	14-216	2H71	D15
RH W/SCREEN WIPER CONT	15-216	2H72	A15
RH DASH INST LTS SUP	13-216	L371	E 9
RH DASH FLOOD SUP	5-213	L235	A19
CHART STOWAGE LTS SUP	15-216	L237	D12
PLT's LT TEST SUP	15-215	L1001	E14

(2) Remove the appropriate switch panel (Ref.33-10-00) and the access panel complete with the chart/cup holder assembly.

(3) Carefully part the insulation blankets to gain access to the area.

C. Remove

(1) Cut the wire securing the drive shaft union nut to the wiper motor. Unscrew the union nut and withdraw the shaft from the motor.

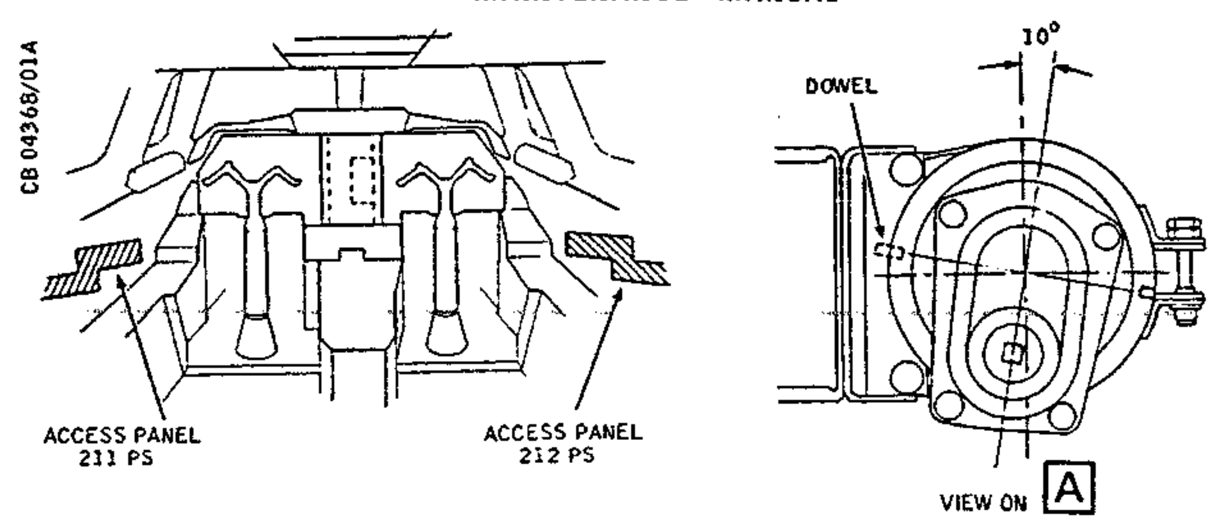
(2) Tape the flexible union nut to the end of the shaft, so that the union nut cannot slide down the shaft into the guide tube.

(3) Disconnect the electrical plug from the wiper motor.

(4) Remove the locking wire from the attachment strap securing bolts.

(5) Support the motor and undo the securing bolts on the wiper motor attachment straps. Remove the motor, and place suitable blank covers over the electrical receptacle and the drive connection.

NOTE: Do not unscrew the retaining bolts from their safety nuts.



ATTACHMENT STRAPS
SADDLE BLOCK
FORWARD
MOTOR
FLEXIBLE DRIVE SHAFT
A
ELECTRICAL PLUG
DOWEL HOLES
CMB 30 42 12 4 AANO

R Windshield Wiper Motor - Installation
Figure 401

D. Install

(1) Comply with the electrical safety precautions.

(2) Ensure that the attachment straps are secure and undamaged and that the securing bolts and anchor nuts are serviceable.

(3) Ensure that the flexible drive shaft union nut is undamaged.

(4) Position and secure the wiper motor:

(a) Position the motor so that the dowels in the saddle block engage the appropriate dowel holes in the motor casing; secure the motor with the attachment straps and bolts. Do not torque load the bolts.

R (b) Check that the radial clearance between the flexible drive shaft and the entrance of the conduit is at least 0.050 in (1.27 mm). If necessary, slacken the bolts securing the saddle block and adjust the block position on its elongated mounting slots as required; retighten each bolt hand tight.

R (c) Torque-load each of the bolts securing the attachment straps to between 28 and 33 lbf in (0.316 and 0.395 mdaN).

R (5) Remove the tape securing the union nut to the end of the flexible drive shaft, and ensure that the union nut does not slide down the shaft into the guide tube. Fit the end of the shaft into the motor, ensuring that the square socket of the inner shaft engages on the square end of the motor drive shaft. Secure the shaft by tightening the union nut into the motor. Torque-load the union nut to between 18 and 22 lb in (0.203 and 0.249 mdaN).

(6) Ensure that the electrical plug and receptacle are clean and undamaged; connect the plug to the motor.

(7) Remove the circuit breaker safety clips and set the circuit breakers.

(8) Operationally test the windshield wiper operation (Ref. 30-42-00, Adjustment/Test).

(9) Ensure that the insulation blankets are undamaged and fit into position.

(10) Fit the access panel.

(11) Fit the switch panel.(Ref. 33-10-00).

WINDSHIELD WIPER FLEXIBLE DRIVE-SHAFT - SERVICING

WARNING: THE RAIN REPELLENT FLUID CONTAINS VOLATILE SOLVENTS. AVOID PROLONGED BREATHING OF THE VAPOUR ALSO FLUID CONTACT WITH THE SKIN. IF THE FLUID CONTACTS THE EYES FLUSH THEM IMMEDIATELY WITH CLEAN WATER AND OBTAIN MEDICAL ATTENTION.

1. General

The flexible drive-shaft transmits the output drive from the wiper motor to the wiper head and is housed in a guide tube which is built in to the structure immediately below each DV window.

The flexible drive-shaft has to be completly removed from the aircraft to carry out the servicing procedure.

The visor and the droop nose must be fully lowered and locked in position before attempting to remove the flexible drive-shaft from the aircraft.

2. Flexible Drive-shaft (Ref. Fig. 301)

A. Equipment and Materials

DESCRIPTION	PART NO.
Trichloroethane (20-30-00, No.462)	-
Grease (20-30-00, No.52)	Aeroshell 22

B. Prepare

(1) Remove the windshield wiper flexible drive shaft (Ref.30-42-13, Removal/Installation).

C. Service

(1) Withdraw the circlips, washers and square drives from the sheath ends.

(2) Pull the cable from the sheath.

(3) Throughly clean the cable and square drives with trichloroethane; dry with a compressed air-jet.

CAUTION: THE SHEATH MUST NOT COME INTO CONTACT WITH

CR 09479/00A

NUT SLEEVE
WASHER
CIRCLIP
CABLE
SHEATH
SHEATH END
SQUARE DRIVE

CMB 30 42 13 3 AAMO

Windshield Wiper Flexible
Drive-Shaft - Servicing
R Figure 301

TRICHLOROETHANE.

(4) Examine the cable, square drives, rings and washers for signs of wear; renew damaged parts where necessary.

(5) Lubricate the cable and square drives with a thin coat of grease.

(6) Refit the cable into the sheath.

(7) Locate and refit the square drives to the cable ends.

(8) Refit the washers and rings to the sheath assembly.

(9) Check that the cable can be rotated smoothly within the sheath.

D. Conclusion

(1) Install the windshield wiper flexible drive-shaft

(Ref.30-42-13, Removal/Installation).

R B (2) Carry out functional test of the Windscreen Wiper
R B System I.A.W. 30-42-00 pb 500 para. 3.

WINDSHIELD WIPER FLEXIBLE DRIVE SHAFT - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS AS DETAILED IN 24-00-00.

R

R NOTE: The rain repellent fluid system has been rendered inoperative.

1. General

The flexible drive shaft transmits a constant drive from the wiper motor to the wiper head, and is housed in a guide tube which is built into the aircraft structure. The visor and the droop nose must be fully lowered and locked in position before attempting to carry out the removal or installation of the drive shaft.

2. Windshield Wiper Flexible Drive Shaft (Ref. Fig. 401)

CAUTION: PHOSPHOR BRONZE FERRULES ARE FITTED TO BOTH ENDS OF THE FLEXIBLE DRIVE SHAFT. THESE FERRULES ARE NOT ATTACHED TO ANY COMPONENT THEREFORE CARE MUST BE TAKEN TO ENSURE THEY ARE NOT DROPPED INTO THE AIRCRAFT STRUCTURE DURING THE REMOVAL/INSTALLATION OF THE FLEXIBLE DRIVE SHAFT.

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking sleeve	E925091000
Torque spanner (0-30 lbf in 0.0-0.339 mdaN range)	-

B. Prepare

(1) Make available electrical ground power (Ref. 24-41-00, Servicing).

(2) Fully lower the visor and droop nose (Ref. 27-61-00).

(3) Trip the circuit breakers associated with the visor, droop nose, and rain dispersal system and secure them in position with safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH W/SCREEN WIPER CONT.	1-213	1H 72	J 8
NOSE 7 1/2 DEG CONT.		M 12	Q16
NOSE/VISOR ST'BY LOWER SUP		M 13	Q17
LH W/SCREEN WIPER SUP.	2-213	1H 71	E23
RH W/SCREEN WIPER SUP.	14-216	2H 71	D15
VISOR & NOSE CONT.	15-215	M 11	F 8
RH W/SCREEN WIPER CONT.	15-216	2H 72	A15

(4) Place a warning placard on the visor, droop nose section of the pilots' dash panel indicating that the visor and droop nose must not be operated.

(5) Remove access panel 113DB, and fit the locking sleeve to the droop nose actuator.

(6) Remove the wiper actuating arm (Ref. 30-41-14, Removal/Installation).

(7) Remove the countersunk screws securing panels 113NZ or 114NZ and remove the panel.

(8) Remove the four countersunk screws securing the wiper head access panel. Remove the panel which abuts the inner side of the aircraft structure, to which it is attached by a terylene cord.

(9) Remove the countersunk screws securing the wiper motor access panel in the flight compartment; remove the panel.

C. Remove

CAUTION: WHEN THE WINDSHIELD WIPERS ARE OPERATED FOR MAINTENANCE PURPOSES THE WINDSHIELD MUST BE ~~LUBRICATED WITH WATER~~.

(1) Cut the wire securing the drive shaft union to the wiper motor. Unscrew the union and retain the phosphor bronze ferrule.

(2) Remove the three countersunk bolts and distance piece retaining the wiper head.

(3) Cut the wire securing the drive union to the wiper head, and unscrew the union.

(4) With the wiper head still inside the bulkhead, withdraw the drive shaft and retain the phosphor bronze ferrule.

(5) Pull steadily on the drive shaft to withdraw the shaft from the guide tube.

D. Install

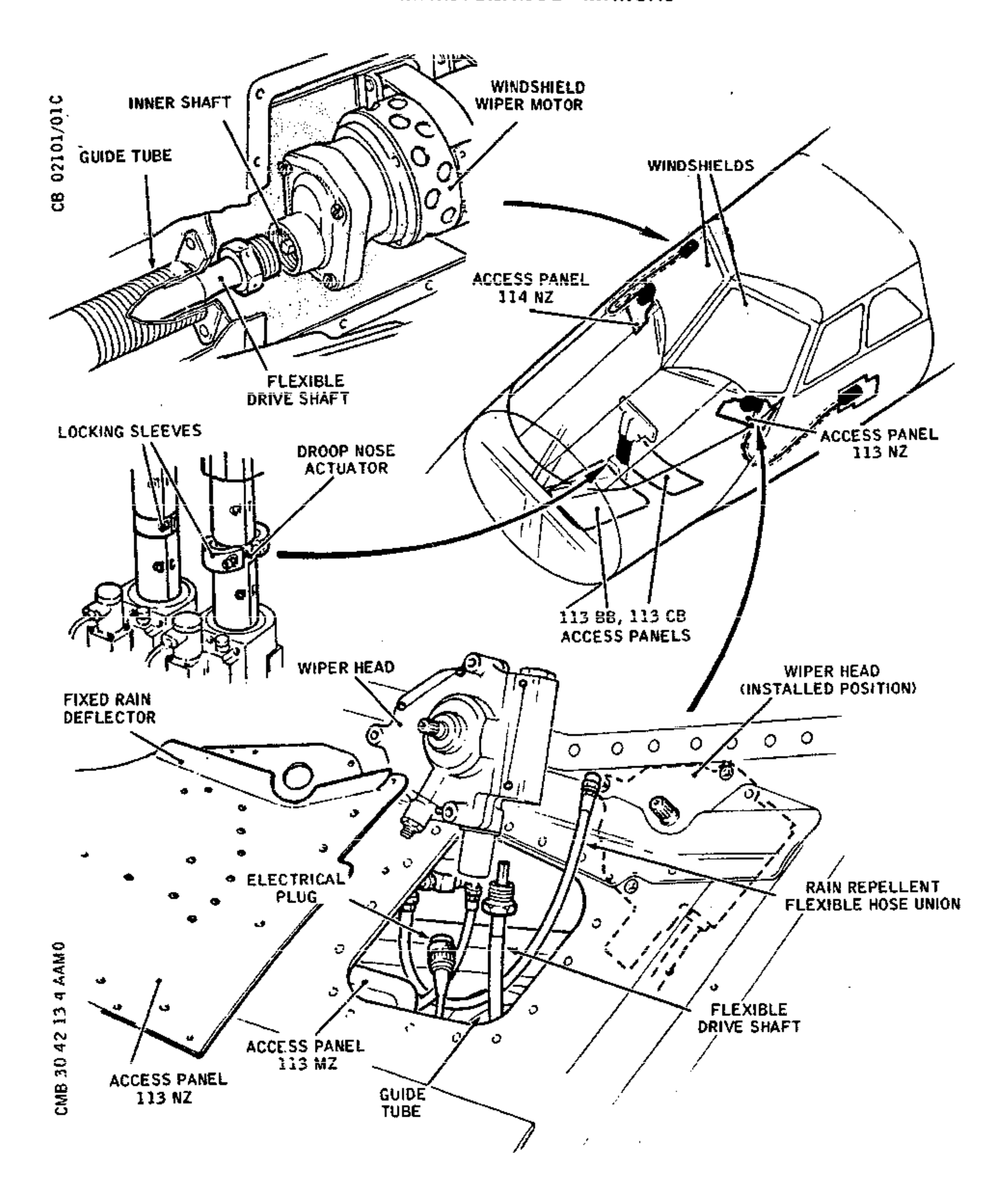
(1) Comply with the electrical safety precautions.

(2) Ensure that the locking sleeve is fitted to the droop nose actuator.

R (3) Thread the leading end of the drive shaft with the domed end cap, through the wiper head access hole, and on into the guide tube. Continue to thread the shaft into the tube until the cap emerges from the other end of the tube.

NOTE: A domed end cap is fitted to a replacement shaft only to retain the union in position for subsequent assembly to the motor.

(4) Unscrew the plastic domed end cap and discard it. Fit the end of the shaft into the wiper motor, ensuring that the squared ferrule of the inner shaft engages with the square end of the wiper motor. Secure the shaft by screwing the union into the wiper motor. Torque load the union to between 18 and 22 lbf in
R (0.203 and 0.249 mdaN) and lock with 0.028 in



Windshield Wiper Flexible Drive Shaft -Installation
Figure 401

R

(0.71 mm) dia wire to the wiper motor.

(5) Remove the plastic cap from the wiper head end of the drive shaft and discard it. Install the wiper head (Ref. 30-42-11), including the ferrule.

(6) Remove the rain dispersal circuit breaker safety clips and set the circuit breakers.

(7) Fit the wiper head access panel, and panel 113NZ (or 114NZ)

(8) Fit the wiper motor access panel in the flight compartment.

(9) Install the wiper actuating arm (Ref.30-42-14, Removal/Installation).

(10) Operationally test the windshield wiper (Ref. 30-42-00, Adjustment/Test).

(11) Remove the locking sleeve from the droop nose actuator.

(12) Fit the access panels and remove the warning placard from the pilot's dash panel. Remove the visor and droop nose circuit breaker safety clips and reset the circuit breakers.

(13) Switch off and disconnect the ground electrical power (Ref. 24-41-00).

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WINDSHIELD WIPER ACTUATING ARM - REMOVAL/INSTALLATION

NOTE: The rain repellent fluid system has been rendered inoperative.

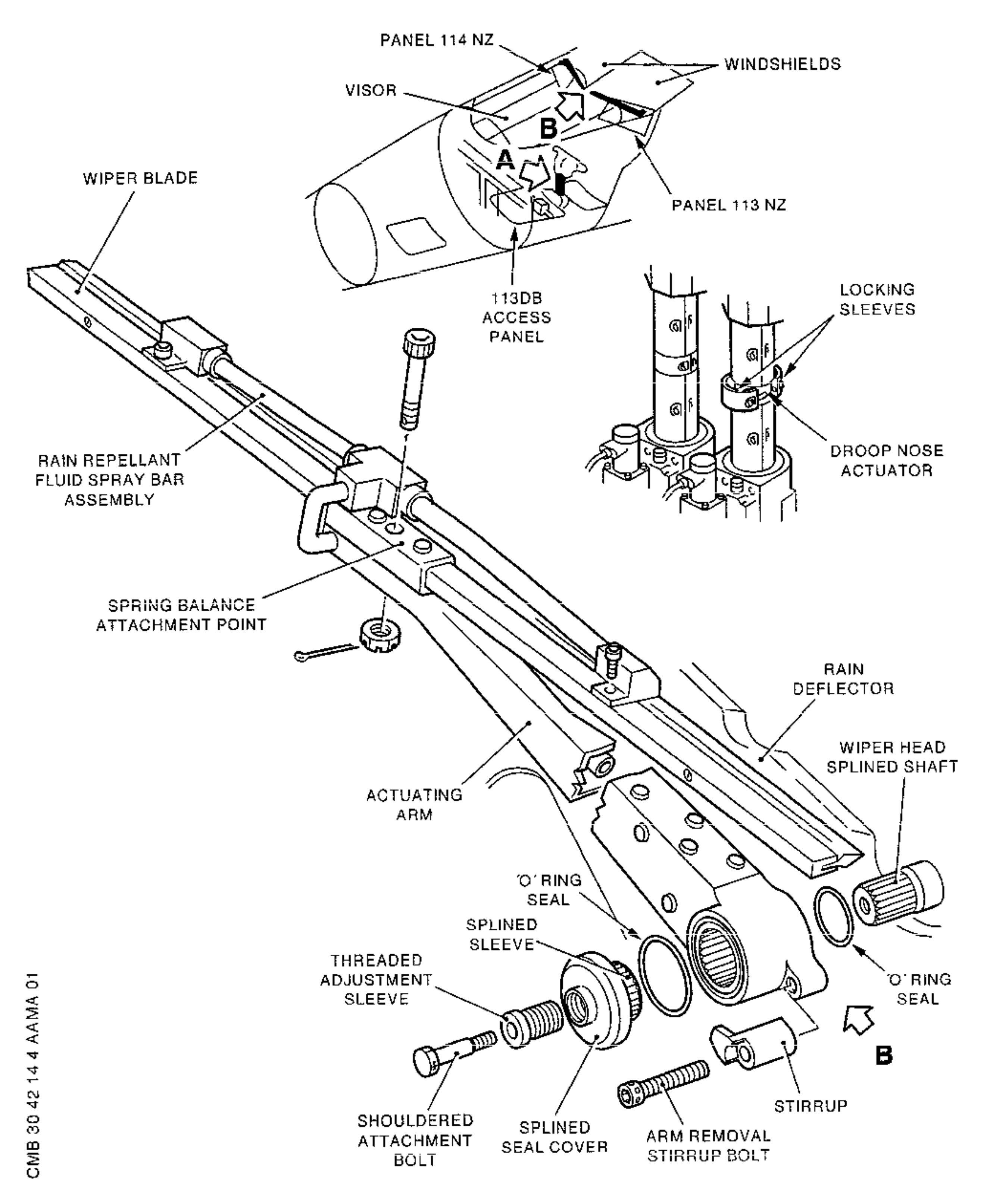
1. General

Each wiper actuating arm has a wiper blade which can be removed with the arm in situ. The arm is also an integral part of the rain repellent system and care should be taken when removing the arm in case any fluid is retained in the arm assembly. The visor and droop nose must be fully lowered, the droop nose locked and the associated circuit breakers tripped, before attempting a removal or installation of the wiper actuating arm or blade.

2. Windshield Wiper Actuating Arm (Ref. Fig. 401)

A. Equipment and Materials

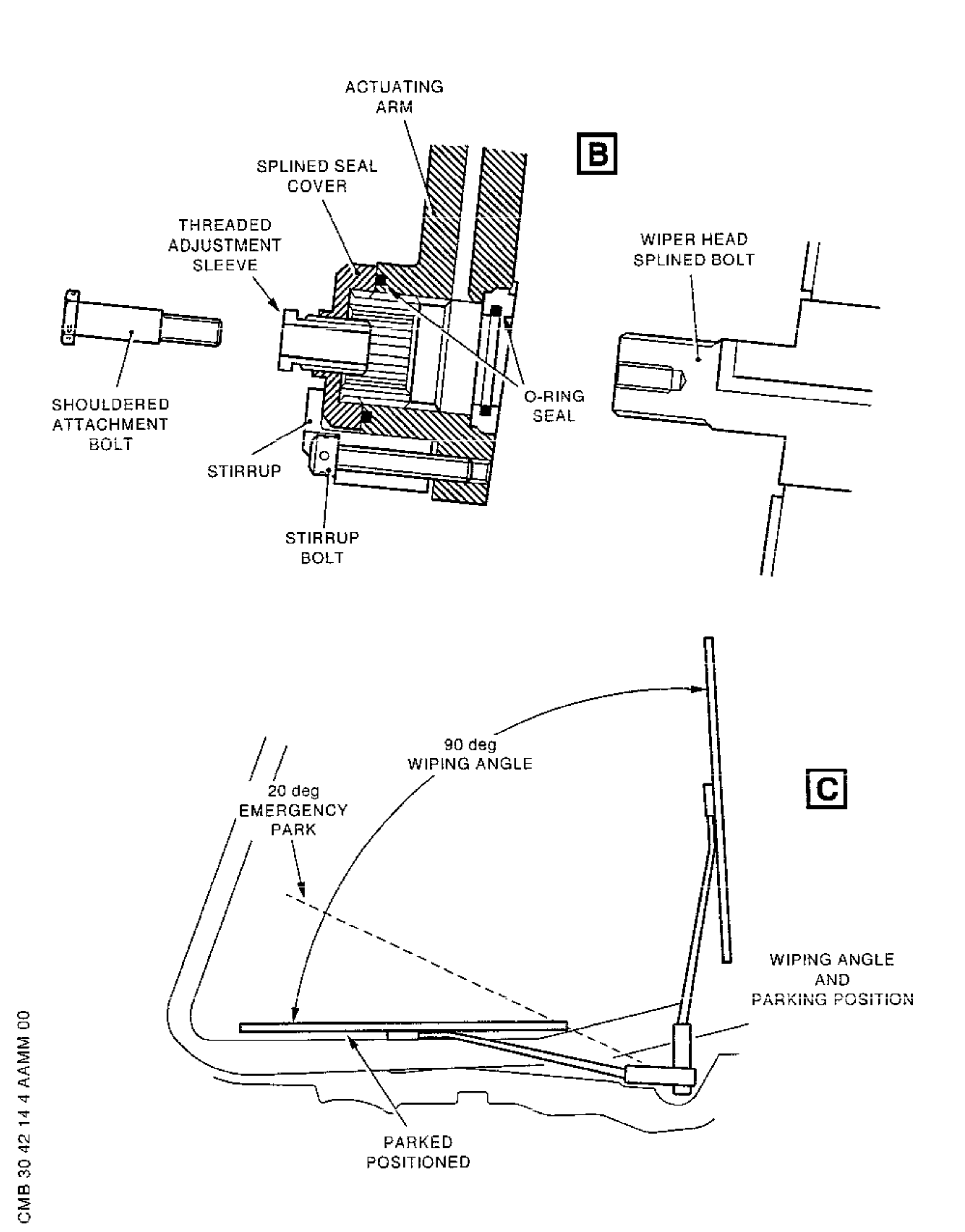
DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Torque spanner 0-30 lbf in (0-0.339 mdaN) range	-
Locking sleeve	E925091000
Lockwire 0.028 in (0.7 mm) dia. Corrosion resistant steel	-
Steel rule, 6 in (150 mm) length	-
Spring balance, range 0-25 lbs (0-12 kg)	-
Grease MS4 (Ref. 20-30-00, No.66)	-



CMB 30 42 14 4 AAMA 01

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Windshield Wiper Actuating Arm - Installation
(Sheet 1 of 2)
Figure 401



Windshield Wiper Actuating Arm - Installation
(Sheet 2 of 2)
Figure 401

B. Prepare

(1) Make available electrical ground power (Ref. 24-41-00, Servicing).

(2) Fully lower the visor, and droop the nose (Ref. 27-61-00).

(3) Trip the circuit breakers associated with the droop nose, visor and rain dispersal system. Fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH W/SCREEN WIPER CONT	1-213	1H 72	J 8
NOSE 7 1/2 DEG CONT		M 12	Q16
NOSE/VISOR ST'BY LOWER SUP		M 13	Q17
LH W/SCREEN WIPER SUP	2-213	1H 71	E23
RH W/SCREEN WIPER SUP	14-216	2H 71	D15
VISOR AND NOSE CONT	15-215	M 11	F 8
RH W/SCREEN WIPER CONT	15-216	2H 72	A15

(4) Place a warning placard at the visor droop nose normal selector switches, on the pilots' dash panel, indicating that the visor and droop nose must not be operated.

(5) Remove access panel 113DB, and fit the locking sleeve to the droop nose actuator.

CAUTION: WHEN THE WINDSHIELD WIPERS ARE OPERATED FOR MAINTENANCE PURPOSES THE WINDSHIELD MUST BE LUBRICATED WITH WATER.

(6) Spray the windshield with water, and set the wiper control on the dash panel to "SLOW".

(7) Reset the relevant circuit breaker W/SCREEN WIPER CONT: this will cause the arm to move to the bottom of the wipe angle.

(8) Trip the circuit breaker previously set in operation (7) and fit the safety clip.

C. Remove

(1) Remove the locking wire, shouldered attachment bolt, stirrup bolt and stirrup.

(2) Replace the stirrup bolt in the actuating arm, and protect the aircraft skin where the stirrup bolt will contact it, with a piece of suitable material.

NOTE: Ensure that the threaded adjustment sleeve remains in the same position relative to the splined cap. Either mark or tape together the cap and sleeve.

(3) Turn the stirrup bolt to impinge on the protective material, continue turning the screw to push the actuating arm from the wiper head shaft. Remove the wiper head shaft O-ring seal and discard it.

D. Prepare to Install

(1) Comply with the electrical safety precautions, and ensure that the locking sleeve on the droop nose actuator is fitted.

(2) Reset the relevant circuit breakers associated with the wiper supply.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH W/SCREEN WIPER CONT (28 volt DC)	1-213	1H 72	J 8
LH W/SCREEN WIPER SUP (115 volt AC)	2-213	1H 71	E23
RH W/SCREEN WIPER SUP (115 volt AC)	14-216	2H 71	D15
RH W/SCREEN WIPER CONT (28 volt DC)	15-216	2H 72	A15

(3) Make available electrical ground power as detailed in 24-41-00, (Servicing).

(4) Establish the wiper head shaft position to the lowest point of wipe:

(a) Set the relevant wiper rotary control switch to "SLOW" and operate for a short time, then select the switch "OFF".

(b) Trip the relevant W/SCREEN WIPER SUP circuit breaker.

(c) Set the relevant wiper rotary control switch to "SLOW". This action will move the wiper head spline shaft to a position which coincides with the bottom of the wiper angle, which is the parked position (Ref. Fig. 401).

(5) Trip the relevant W/SCREEN WIPER CONT circuit breaker and fit the safety clip.

E. Install

(1) Apply lubricant MS4 to two O-ring seals then assemble the seals to the actuating arm.

(2) Assemble the splined seal cover together with the threaded adjustment sleeve to the actuating arm and, gently, secure in position with the stirrup and bolt.

NOTE: The adjustment sleeve must be screwed fully into the splined cap before it is assembled to the actuating arm, unless the sleeve/cap has been removed as described in operation C (2).

(3) Mount the actuating arm assembly so that the centre line of the arm, at a point 10 in (254 mm) from the wiper head shaft is positioned 0.5 in (12.7 mm) above the edge of the windshield frame.

(4) Secure the wiper arm assembly in position by inserting, and screwing fully in, the shouldered attachment bolt.

(5) Set the initial blade pressure:

(a) Attach the spring balance to the blade attachment point (Ref. Fig. 401).

(b) Adjust the blade pressure by screwing, progressively, on the threaded sleeve, to give the correct loading.

NOTE: The blade pressure is set when the force required to lift the wiper arm clear of the glazing by 0.003 to 0.005 in (0.067 to 0.127 mm) is between 12 and 16 lbf (5.44 and 7.26 kgf) load.

(6) Establish the parked position:

CAUTION: WHEN THE WINDSHIELD WIPERS ARE OPERATED FOR MAINTENANCE PURPOSE THE WINDSHIELD MUST BE LUBRICATED WITH WATER.

(a) Reset the relevant circuit breaker W/SCREEN WIPER CONT, and select 'OFF' on the relevant wiper rotary control switch.

(b) Note that the wiper arm assembly parks at the bottom of its stroke, on the windshield panel. If necessary, re-set the arm by re-positioning the splined cap assembly.

NOTE: Ensure that the threaded adjustment sleeve remains in the same position relative to the splined cap by either marking or taping together the cap and sleeve.

(7) Check blade travel (Ref. Fig. 401).

(a) Remove the relevant safety clips and re-set the W/SCREEN WIPER SUP and CONT circuit breakers.

(b) Spray the windshield with water.

(c) Turn the relevant wiper rotary switch to "SLOW". Check that the wiping angle is between 85 and 90 deg and that the arm does not over-run the edge of the windshield.

(d) Turn the relevant wiper rotary switch to "FAST". Check that the wiping angle is between 85 and 90 deg and that the arm does not over-run the edge of the windshield.

(e) Turn the relevant wiper rotary switch to "OFF" and ensure that the arm parks at the bottom of its stroke, on the windshield panel.

(f) Check the relevant W/SCREEN WIPER CONT circuit breaker has not tripped.

(g) If necessary, adjust on the splined cap to achieve all the conditions mentioned above.

NOTE: Ensure that the threaded adjustment sleeve remains in the same position relative to the splined cap by either marking or taping together the cap and sleeve.

(8) Set the final blade pressure:

(a) Attach the spring balance to the blade attachment point.

(b) Adjust the blade pressure as near to 16 lbf (7.36 kgf) as possible measured at the low, mid and high sweep position on the windshield. At the mid and high positions, the blade pressure may be between 12 and 20 lbf (5.44 and 9.07 kgf) to account for variations in actuating arm/glazing squareness. At the low position the blade pressure must not exceed 18 lbf (8.16 kgf).

NOTE: The thread adjustment sleeve must be used only to increase blade pressure. Where it is necessary to decrease blade pressure the stirrup bolt must be used (Ref. para. 2.C. Removal).

(c) Wire lock the shouldered attachment bolt to the threaded adjustment sleeve, and the adjustment sleeve to the stirrup bolt.

(9) Check that the wiper blade will return to the emergency park position:

(a) Remove safety clips and reset the relevant W/SCREEN WIPER SUP circuit breaker.

(b) Spray the windshield with water.

(c) Turn the relevant rotary switch to "SLOW", and while the arm is moving trip the W/SCREEN WIPER SUP circuit breaker to stop the arm within 5 deg of the upper travel of the arc during the upstroke of the wiper.

(d) Select "EMERG PARK" on the rotary switch and ensure that the arm returns to the emergency park position (Ref. Fig. 401).

NOTE: The emergency park position is within a 20 deg arc from the parked position. Red marks are painted on the windshield centre pillar and adjacent windshields to indicate the top limit of the emergency park area (Ref. 11-33-00).

(e) Select "OFF" on the rotary switch and check that the wiper arm returns to the park position, on the windshield panel (Ref. Fig. 401).

(10) Remove the locking sleeve from the droop nose actuator, fit the access panels, and remove the warning placard from the pilots' dash panel. Remove the circuit breaker safety clips and set the circuit breakers.

(11) Switch off and disconnect electrical ground power (Ref. 24-41-00, Servicing).

3. Windshield Wiper Blade (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Locking sleeve	E925091000
Lockwire 0.028 in (0.71 mm) dia. corrosion resistant steel	-
Ardrox 6025T (Made from 3 parts 6025AF, Ref. 20-30-00, No.455 and 7 parts Kerosene)	-

B. Prepare

(1) Make available electrical ground power.

(2) Fully lower the visor, and droop the nose (Ref. 27-61-00).

(3) Trip the circuit breakers associated with the droop nose and visor and fit safety clips.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH W/SCREEN WIPER CONT	1-213	1H 72	J 8
NOSE 7 1/2 DEG CONT		M 12	Q16
NOSE/VISOR ST'BY LOWER SUP		M 13	Q17
LH W/SCREEN WIPER SUP	2-213	1H 71	E23
RH W/SCREEN WIPER SUP	14-216	2H 71	D15
VISOR AND NOSE CONT	15-215	M 11	F 8
RH W/SCREEN WIPER CONT	15-216	2H 72	A15

(4) Place a warning placard at the visor droop nose normal selector switches, on the pilots' dash panel, indicating that the visor and droop nose must not be operated.

(5) Remove access panel 113DB, and fit the locking sleeve to the droop nose actuator.

CAUTION: WHEN THE WINDSHIELD WIPERS ARE OPERATED FOR MAINTENANCE PURPOSES THE WINDSHIELD MUST BE LUBRICATED WITH WATER.

(6) Spray the windshield with water, and set the wiper control on the dash panel to "SLOW".

(7) Reset the relevant circuit breaker W/SCREEN WIPER CONT. This will cause the arm to move to the bottom of the wiper angle.

(8) Trip the circuit breaker previously tripped in operation (7) and fit the safety clip.

C. Remove

(1) Remove the two bolts securing the rain repellent spray bar to the wiper blade.

(2) Remove the nut and bolt securing the wiper blade in the backing member on the actuating arm. Slide the blade out of the member.

NOTE: Place a piece of protective material on the windshield under the end of the actuating arm, to avoid scratching the windshield when the blade is removed.

D. Install

(1) Comply with the electrical safety precautions, and ensure that the locking sleeve on the droop nose actuator is fitted.

(2) Slide the wiper blade into the actuating arm backing member, and secure it with the bolt and nut, lock the nut with a split pin.

(3) Attach the spray bay to the wiper blade with bolts, and lock with wire to the spray nozzle.

(4) Remove the rain dispersal circuit breaker safety clips and set the circuit breakers.

(5) Check the blade pressure on the windshield and adjust if necessary (Ref. 30-42-00, Adjustment/Test) and operationally test the windshield wiper operation (Ref. 30-42-00, Adjustment/Test).

(6) Remove the locking sleeve from the droop nose actuator, fit the access panels and remove the warning placard from the pilots' dash panel. Remove the circuit breaker safety clips and set the circuit breakers.

(7) Switch off and disconnect the ground electrical power (Ref. 24-41-00, Servicing).

WINDSHIELD WIPER ACTUATING ARM - ADJUSTMENT/TEST

CAUTION: WHEN THE WINDSHIELD WIPERS ARE OPERATED FOR TEST PURPOSES, THE WINDSHIELD MUST BE CONTINUOUSLY LUBRICATED WITH CLEAN WATER.

R NOTE: The rain repellent fluid system has been rendered
R inoperative.

1. General

Overall contact between the windshield wiper blade and the associated windshield panel, must be maintained to ensure satisfactory rain dispersal. The wiper blade must therefore be adjusted when either a windshield panel or a wiper actuating arm is replaced. Blade contact must also be adjusted following a period of supersonic flight after windshield panel replacement, when the panel tends to bow outwards due to a combination of increased temperature and cabin differential pressure.

2. Windshield Wiper Blade (Ref. Fig. 501)

A. Equipment and Materials

DESCRIPTION	PART NO.
Droop nose locking sleeves	E925091000
Circuit breaker safety clips	-
Lockwire 0.028 in (0.7 mm) dia. corrosion resistant steel	-

B. Prepare to Adjust Windshield Wiper Blade

(1) Fully lower the visor and droop nose (Ref. 27-61-00, Adjustment/Test).

(2) Remove panel 113 DB and fit the droop nose locking sleeves.

(3) Place a warning placard on the VISOR/DROOP NOSE selector switch on the pilot's dash panel, indicating that the visor and droop nose must not be operated.

(4) Trip the following circuit breakers and fit safety clips:

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
NOSE 7 1/2 DEG CONT	1-213	M 12	Q16
NOSE/VISOR ST'BY LOWER SUP		M 13	Q17
VISOR CONT	15-215	M 11	F 8

R

B. Adjust Windshield Wiper Blade

(1) Connect and switch on electrical ground power (Ref. 24-41-00, Servicing).

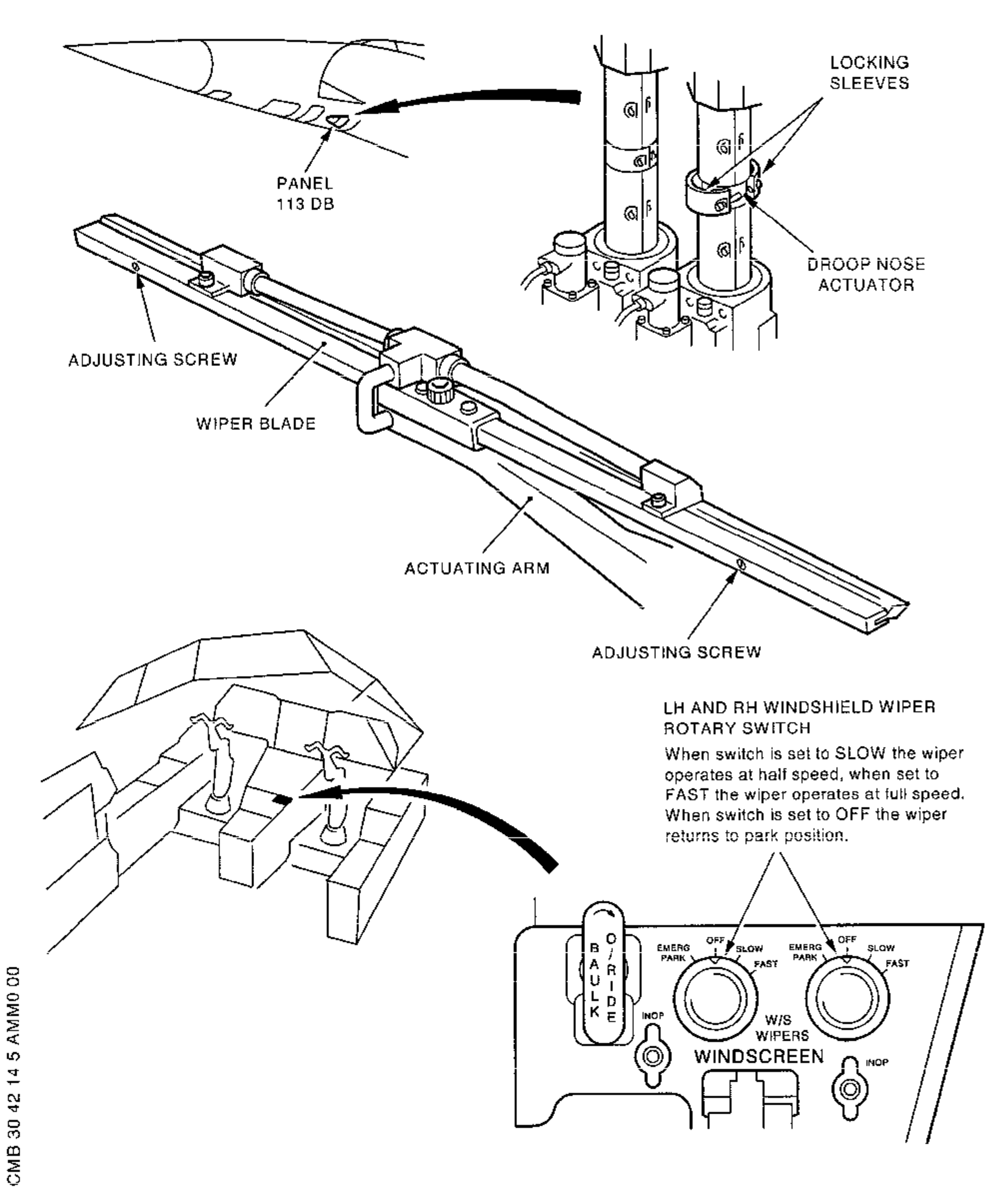
(2) Apply a continuous flow of clean water to cover the windshield panel outer surface.

(3) With personnel and equipment positioned clear of the windshield panel, set the appropriate W/S WIPER control switch first to SLOW and then to FAST, visually checking for areas of insufficient water dispersal on the windshield panel.

(4) Stop wiper operation and water supply and adjust wiper blade contact, as necessary:

(a) Trip the following circuit breakers and fit safety clips:

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH W/SHIELD WIPER CONT	1-213	1H 72	J 8
LH W/SHIELD WIPER SUP	2-213	1H 71	E23
RH W/SHIELD WIPER SUP	14-216	2H 71	D15
RH W/SHIELD WIPER CONT	15-216	2H 72	A15



R Wiper Actuating Arm - Adjustment
Figure 501

R **ON A/C 006-007,

WINDSHIELD WASH FLUID CONTAINER - REMOVAL/ INSTALLATION

1. General

The container (labelled RESERVOIR) is mounted on the forward face of the miscellaneous equipment rack in the flight compartment.

2. Container (Ref. Fig. 401)

A. Remove

(1) Slacken the worm-drive clip securing the container pipe in the joint sleeve.

(2) Remove the screw securing the container retaining strap. Hinge open the strap and remove the container and pipe from the drip tray and pipe sleeve. Fit a blank over the open sleeve end.

(3) Unscrew and remove the container lid together with the pipe and filter. Withdraw the pipe from the lid and the filter from the pipe end.

B. Install

(1) Visually check the gauze filter for cleanliness; if necessary, swill the filter in clean solvent and thoroughly dry it in clean moisture-free compressed air.

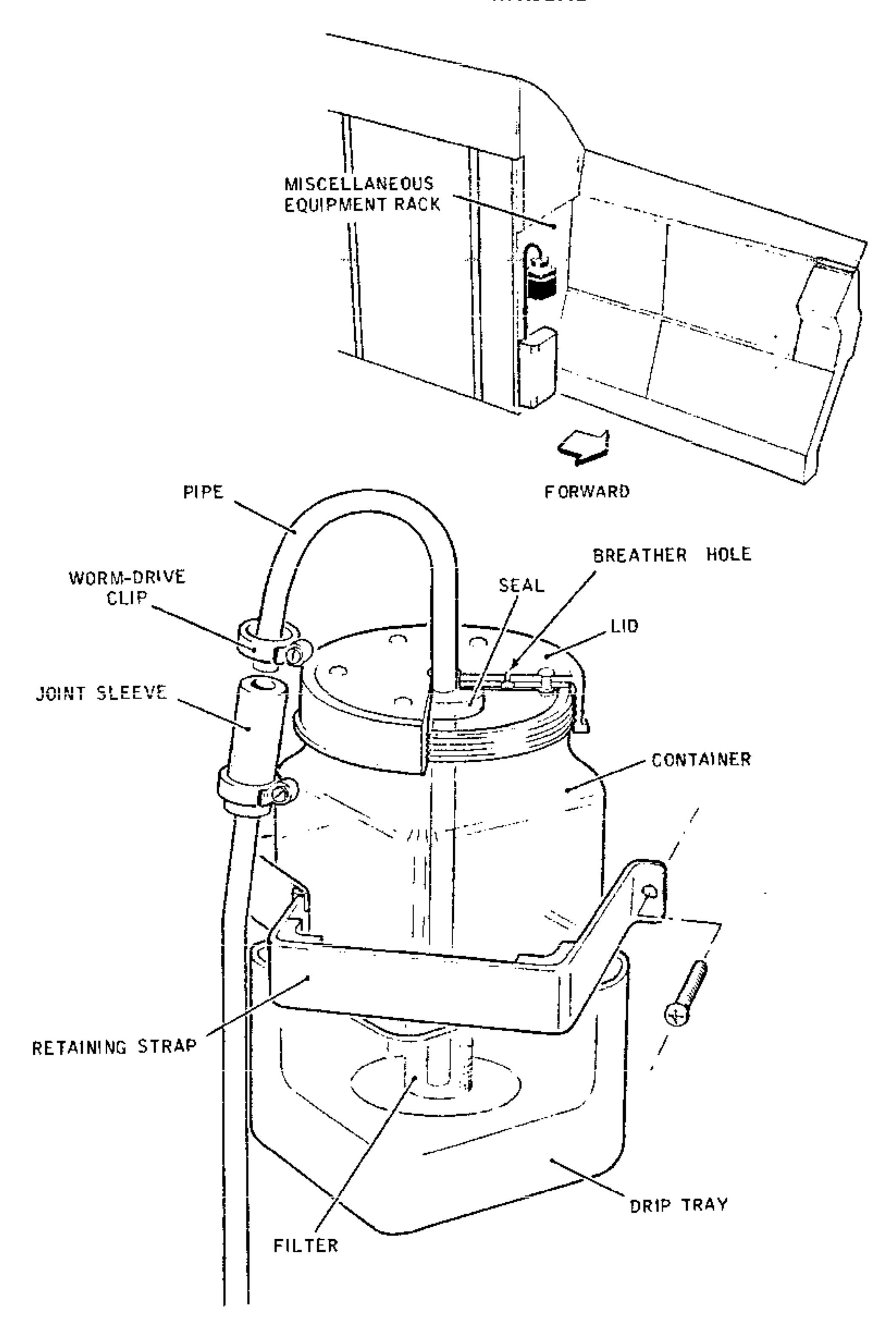
(2) Ensure that the breather holes in the container lid are clear and unobstructed then assemble the lid and seal to the pipe, with the seal locating on the pipe collar.

(3) Place the filter on the end of the pipe and insert the pipe and filter into the container; screw the lid on to the container.

(4) Remove the blank from the sleeve and place the container in the drip tray, engaging the pipe end in the sleeve. Secure the sleeve to the pipe end with the worm-drive clip.

(5) Secure the container by hinging the strap to the closed position and securing it with the screw.

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Windshield Wash Fluid Container
Figure 401

C. Conclusion.

(1) Fill the container with windshield wash fluid (12-16-30).

(2) Check the operation of the windshield wash system (30-42-00, Adjustment/Test).

R **ON A/C 006-007,

ELECTRIC PUMP - REMOVAL/INSTALLATION

1. General

The windshield wash system supply pump is situated on the forward face of the miscellaneous equipment rack in the flight compartment.

2. Electric Pump (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Safety clips, circuit breaker	-
Wire, locking, non-corrodible	-
Suitable container, 0.25 litre capacity	-

B. Remove

(1) Electrically isolate the W/SCREEN WASH FLUID PUMP SYS SUP by tripping circuit breaker H78 on panel 15-215, map ref. A10.

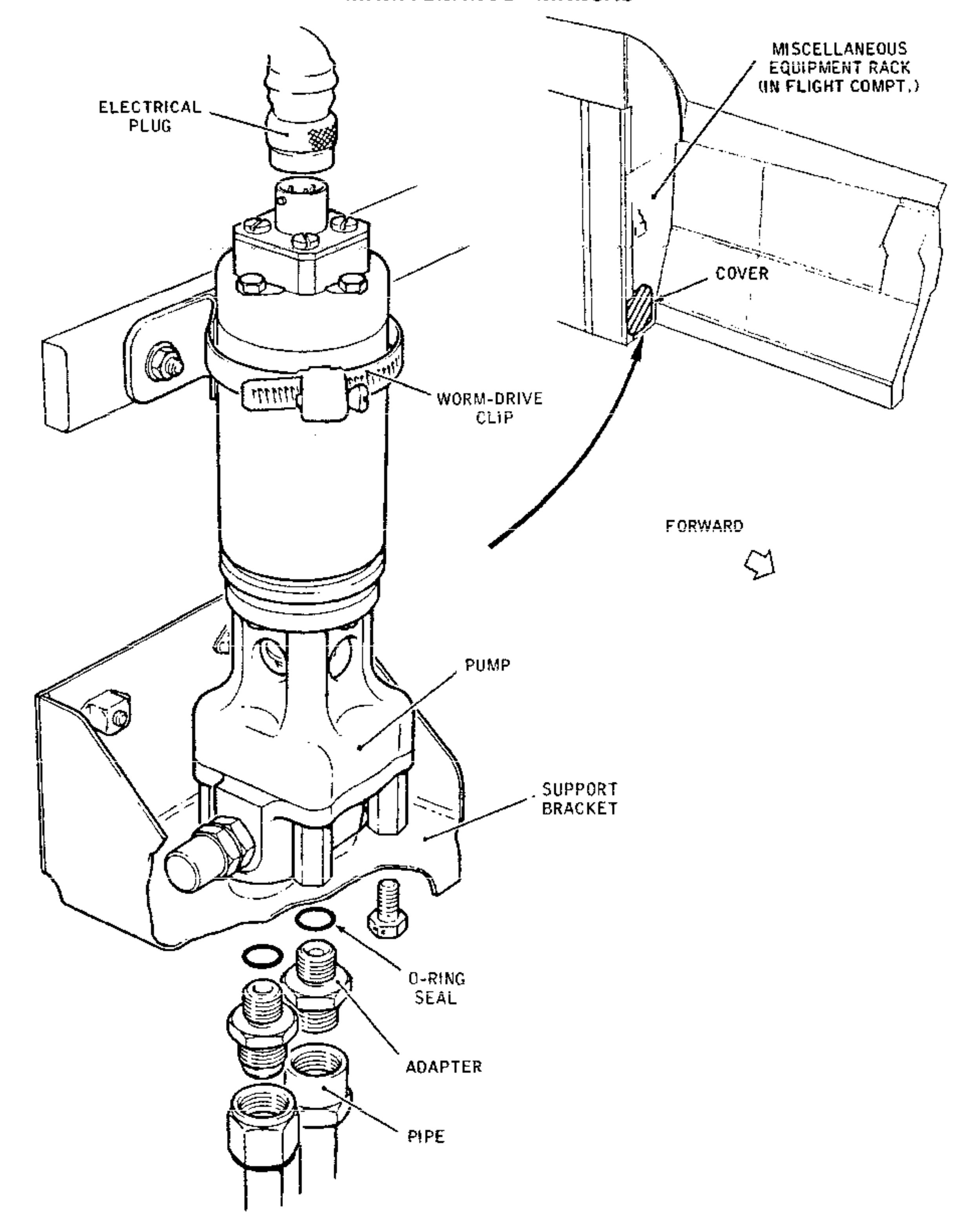
(2) Remove the cover from the windshield wash system components on the forward face of the miscellaneous equipment rack.

(3) Disconnect the electrical supply connector from the pump.

(4) Disconnect the suction and delivery pipes from the bottom of the pump. Be prepared to catch residual fluid draining from the disconnected pipes in a receptacle. Fit blanks to the open pipe ends.

(5) Remove the four bolts securing the pump to the support bracket.

(6) Slacken the pump steady worm-drive clip and slide the pump out of the clip.



Electric Pump - Installation
Figure 401

(7) Remove the two adapters and O-ring seals from the pump.

C. Install

(1) Assemble the two adapters together with new O-ring seals to the pump suction and delivery apertures. Torque tighten each adapter to between 73 and 83 lbf in (0.82 and 0.93 mdaN).

(2) Position the pump in the worm-drive clip and support bracket. Secure the pump to the bracket with the four bolts torque tightened to between 25 and 30 lbf in (0.28 and 0.34 mdaN) and locked together with wire (Ref.20-21-13).

(3) Tighten the worm-drive clip.

(4) Remove the blanks from the system suction and delivery pipes and connect the pipes to the pump adapters. Torque tighten the pipe coupling nuts to between 60 and 70 lbf in (0.67 and 0.79 mdaN).

(5) Connect the electrical supply to the pump ensuring that the connector and receptacle are clean and undamaged.

(6) Reset the circuit breaker previously tripped.

(7) Carry out a functional test of the windshield wash system (Ref.30-42-00, Adjustment/Test).

(8) Replenish the wash fluid container (Ref.12-16-30).

(9) At the completion of the test refit the cover over the windshield wash components on the forward face of the miscellaneous equipment rack.

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R **ON A/C 006-007,

SOLENOID VALVE - REMOVAL/INSTALLATION

1. General

The two solenoid operated shut-off valves, one controlling the LH nozzle supply and one the RH supply, are mounted on the forward face of the miscellaneous equipment rack in the flight compartment. Removal and installation procedure is the same for both valves.

2. Solenoid Valve (Ref. Fig. 401)

A. Equipment and Materials

DESCRIPTION	PART NO.
Safety clip, circuit breaker	-
O-ring seal	BAS 9059-4

B. Remove

(1) Electrically isolate the wash system by tripping the W/SCREEN WASH FLUID PUMP SYS SUP circuit breaker H78 map ref A10 on panel 15-215.

(2) Remove the screws and washers securing the cover over the windshield wash pump and valves installation on the forward face of the miscellaneous equipment rack, and remove the cover.

(3) Disconnect the electrical plug from the valve.

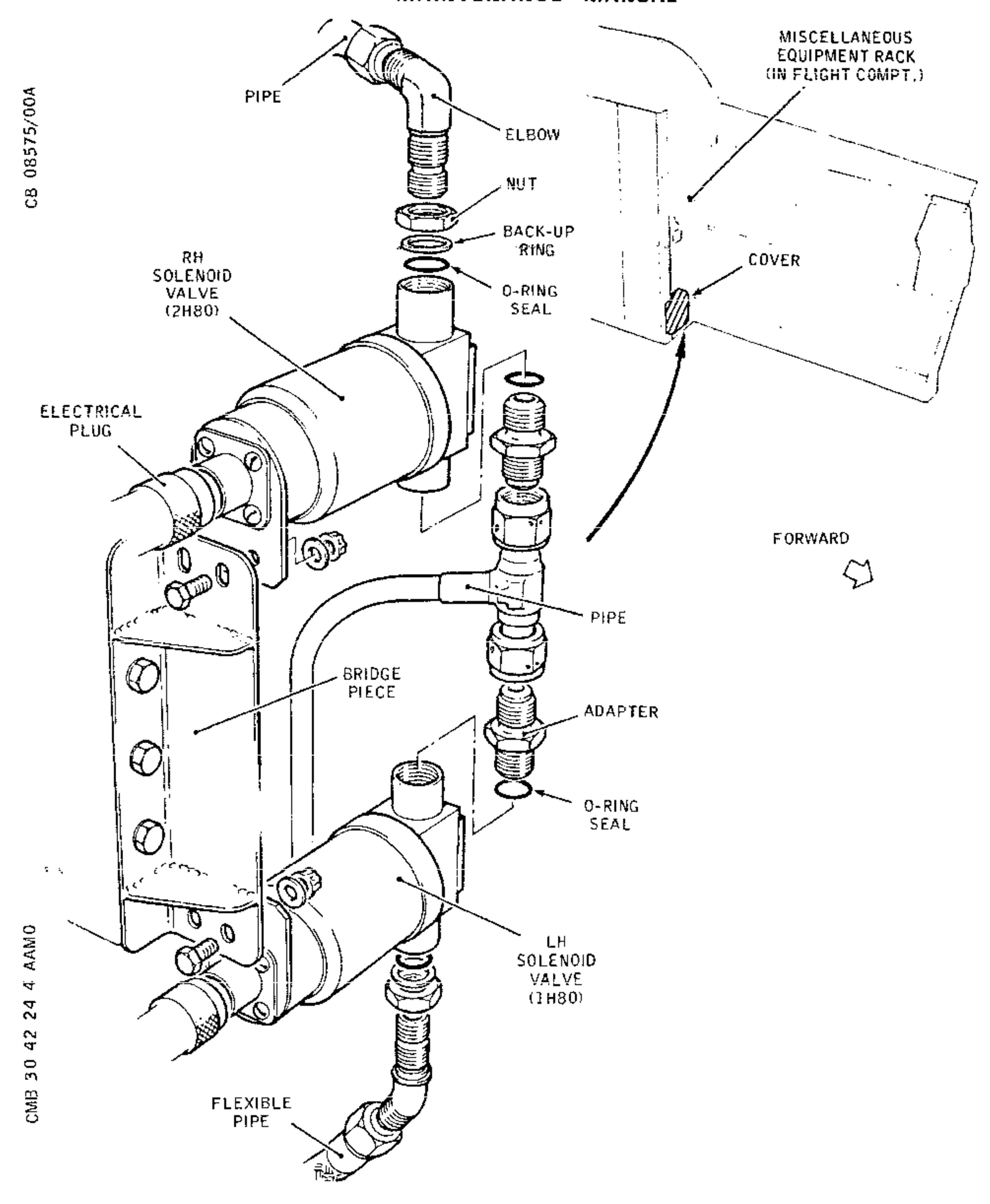
(4) Disconnect the two pipes from the valve assembly. Fit blanks over the open pipe ends.

(5) Remove the bolts securing the valve to the bridge piece and remove the valve.

(6) Remove the adapter and O-ring seal, and the elbow with locknut, back-up ring and O-ring seal from the valve.

C. Install

(1) Assemble the adapter, together with a new O-ring seal,



Solenoid Valve Installation
Figure 401

to the valve. Torque tighten the adapter to between 175 and 185 lbf in (1.98 and 2.1 mdaN).

(2) Loosely assemble the elbow, with the locknut, and the back-up ring and O-ring seal to the valve.

(3) Locate the valve on the bridge piece; secure it with two bolts, washers and nuts.

(4) Remove the blanks from the open pipe ends and connect the pipes to the valve assembly. Torque tighten the pipe connectors to between 60 and 80 lbf in (0.678 and 0.904 mdaN) and the locknut on the elbow to between 295 and 305 lbf in (3.33 and 3.42 mdaN).

(5) Connect the electrical plug to the valve ensuring that the mating surfaces of both connector and receptacle are clean and undamaged.

(6) Reset the circuit breaker previously tripped.

D. Conclusion

(1) Carry out a function check of the system (Ref. 30-42-00, Adjustment/Test).

(2) Fit the cover over the system components on the forward face of the miscellaneous equipment rack.

R **ON A/C 006-007,

WINDSHIELD WASH NOZZLES - REMOVAL/INSTALLATION

1. General

General

Two identical fluid ejection nozzles are mounted on brackets, one at the base of the LH and one at the base of the RH windshield. Removal and installation procedures are similar for both nozzles with the visor or nose lowered to permit access.

2. Nozzles

A. Equipment and Materials

DESCRIPTION	PART NO.
Safety clips, circuit breakers	-
*Locking link, visor lowered	D925468030
*Locking sleeves, droop nose lowered (2)	E925091000
Wire,locking,steel,non-corrodible 0.028in (0.7 mm) dia.	-

* As appropriate

B. Prepare to Remove

(1) If the visor is not in the lowered position, lower it as instructed in 27-61-00, Adjustment/Test.

(2) Electrically isolate the visor and droop nose and the windshield wash system by tripping the circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
VISOR & NOSE CONT.	15-215	M11	F 8
NOSE 7 1/2 CONT	1-213	M12	Q16
NOSE/VISOR STBY LOWER SUP	1-213	M13	Q17

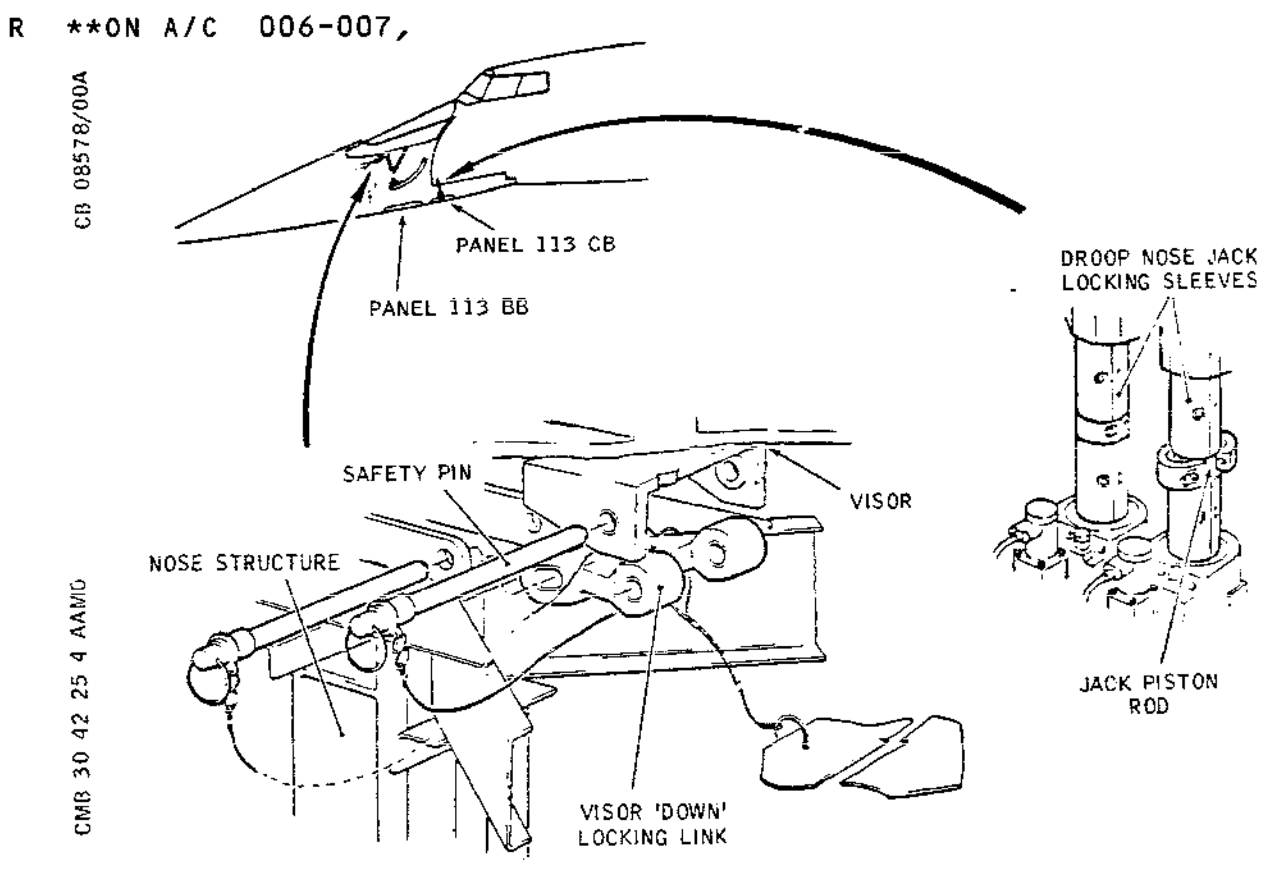
SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
W/SCREEN WASH FLUID PUMP SYS SUP	15-215	H78	A10

(2) Fit the ground locking equipment to secure the visor or nose (as applicable) in the lowered position (Ref. Fig. 401):

(a) If only the visor is lowered, fit the ground locking link.

(b) If the nose is lowered fit the droop nose locking sleeves.

R **ON A/C 006-007,



Ground Locking Equipment
Figure 401

C. Remove (Ref. Fig. 402).

(1) Disconnect the pipe from the adapter on the nozzle assembly.

(2) Unscrew and remove the nut, nozzle and O-ring seal from the assembly.

(3) Remove the locknut and washer, and withdraw the adapter complete with valve plunger, spring and cup.

(4) Fit a blank cover to the exposed end of the pipe.

D. Install (Ref. Fig. 402)

(1) Ensure that the precautions taken prior to removal still apply.

(2) Remove the blank cover from the pipe.

(3) Loosely assemble the adapter to the bracket with the washer and locknut and connect the pipe to the adapter. Torque tighten both the locknut and the pipe coupling nut to between 295 and 305 lbf in (3.33 and 3.45 mdaN).

(4) Insert the valve plunger, spring and cup into the adapter. Locate the nozzle in the cup with a new O-ring seal and secure the assembly with the nut, finger tight.

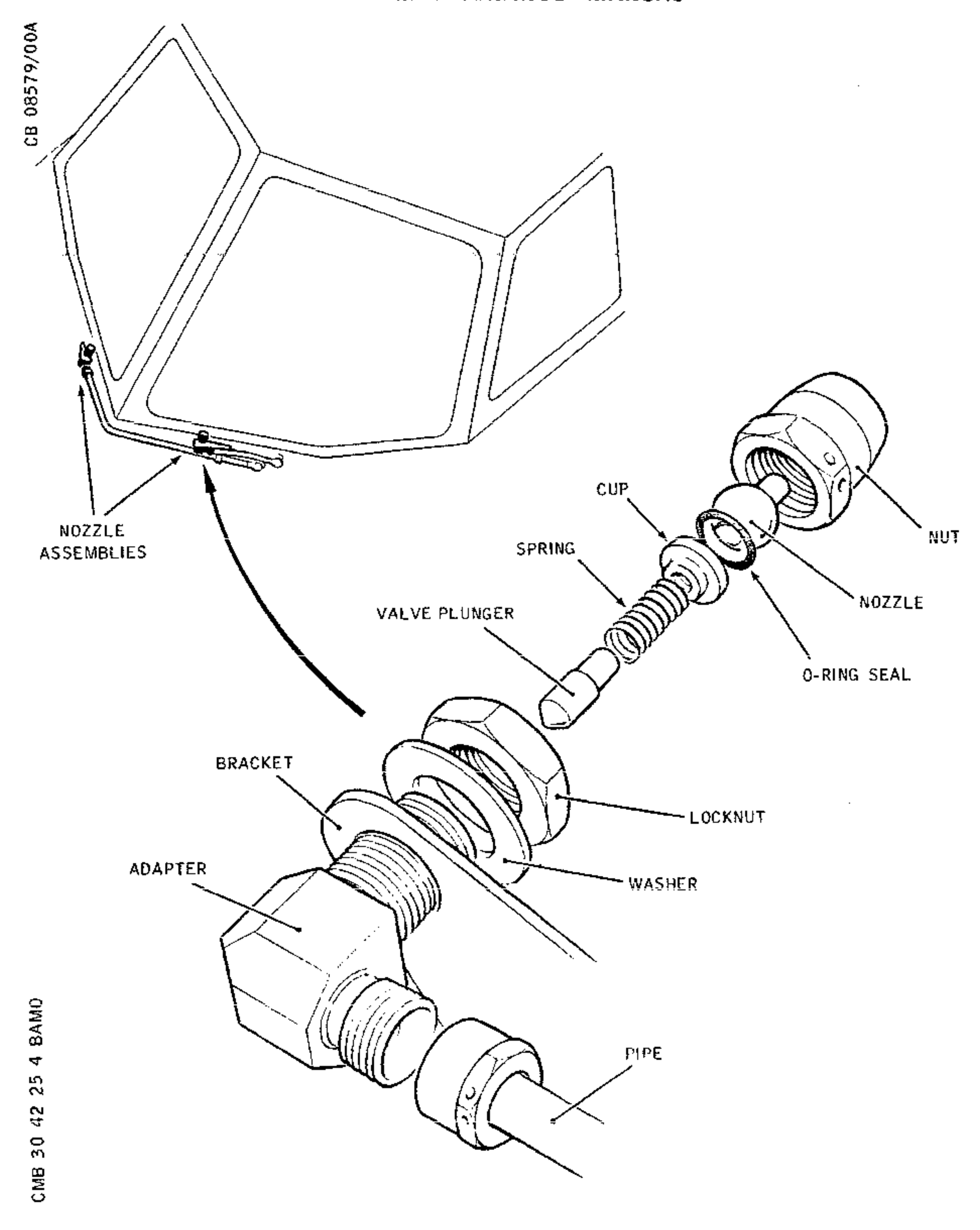
(5) Reset the circuit breaker H78 to provide electrical power to the wind-screen washing system. Operate the system (Ref. 30-42-00, Adjustment/Test) and adjust the nozzle so that the jet of fluid impinges on the windshield at a point 5 inches (127 mm) up from the lower surround and 4.5 inches (114 mm) from the centre pillar.

(6) After the adjustment has been made, torque-tighten the nut to between 25 and 32 lbf in (0.28 and 0.36 mdaN) and lock it with wire to the pipe coupling nut.

(7) Operate the system and recheck the point of fluid impact on the windshield.

E. Conclusion

(1) Remove the ground locking link or locking sleeve, whichever is fitted.



Nozzle Assembly - Installation
Figure 402

(2) Reset the circuit breakers previously tripped.

(3) Ensure that the wash fluid container is filled with fluid (Ref. 12-16-30) .

R **ON A/C 006-007,

FLEXIBLE PIPES - REMOVAL/INSTALLATION

CAUTION: DO NOT ALLOW WINDSCREEN WASH FLUID TO CONTACT THE SKIN OR, IN PARTICULAR, THE EYES. SHOULD THIS HAPPEN, THOROUGHLY FLUSH THE FLUID FROM THE AFFECTED AREA WITH WATER.

1. General

The flexible pipes are fitted between the system pump on the forward face of the flight compartment miscellaneous equipment rack and the forward pressure bulkhead. They are routed beneath the circuit breaker panel structure (Zone 213) and the left-hand side console to the pressure bulkhead. Move the Captain's and first supernumerary's seats on their seat rails for access purposes.

2. Flexible Pipes (Ref. Fig.401 and 402)

A. Equipment and Materials

DESCRIPTION	PART NO.
Safety clips, circuit breakers	-
* Locking link (visor lowered)	D925468030
* Locking sleeve (nose lowered)	E925091000
Suitable container, 1 litre capacity	-

* whichever is applicable

B. Prepare to Remove

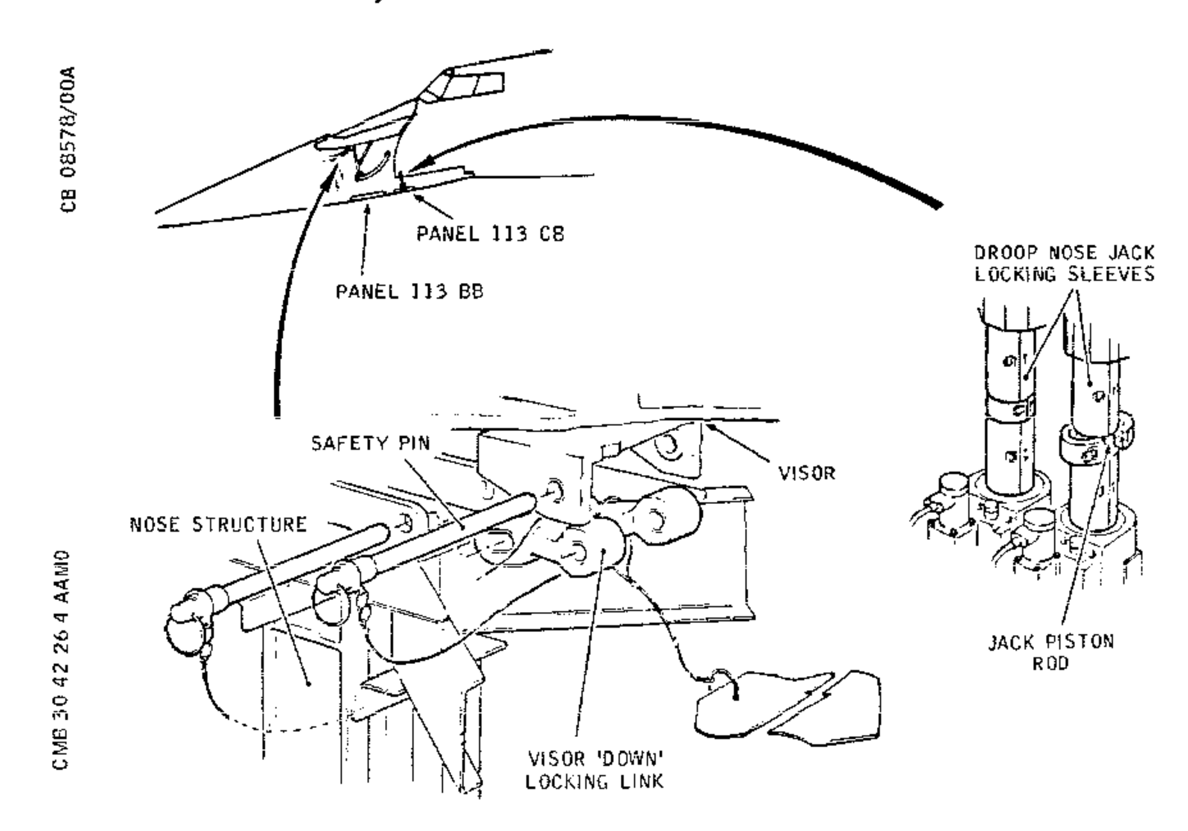
(1) If the visor is not in the lowered position, lower it as instructed in 27-61-00, Adjustment/Test.

(2) Electrically isolate the visor and droop nose and the windshield washer system by tripping the circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF

R **ON A/C 006-007,

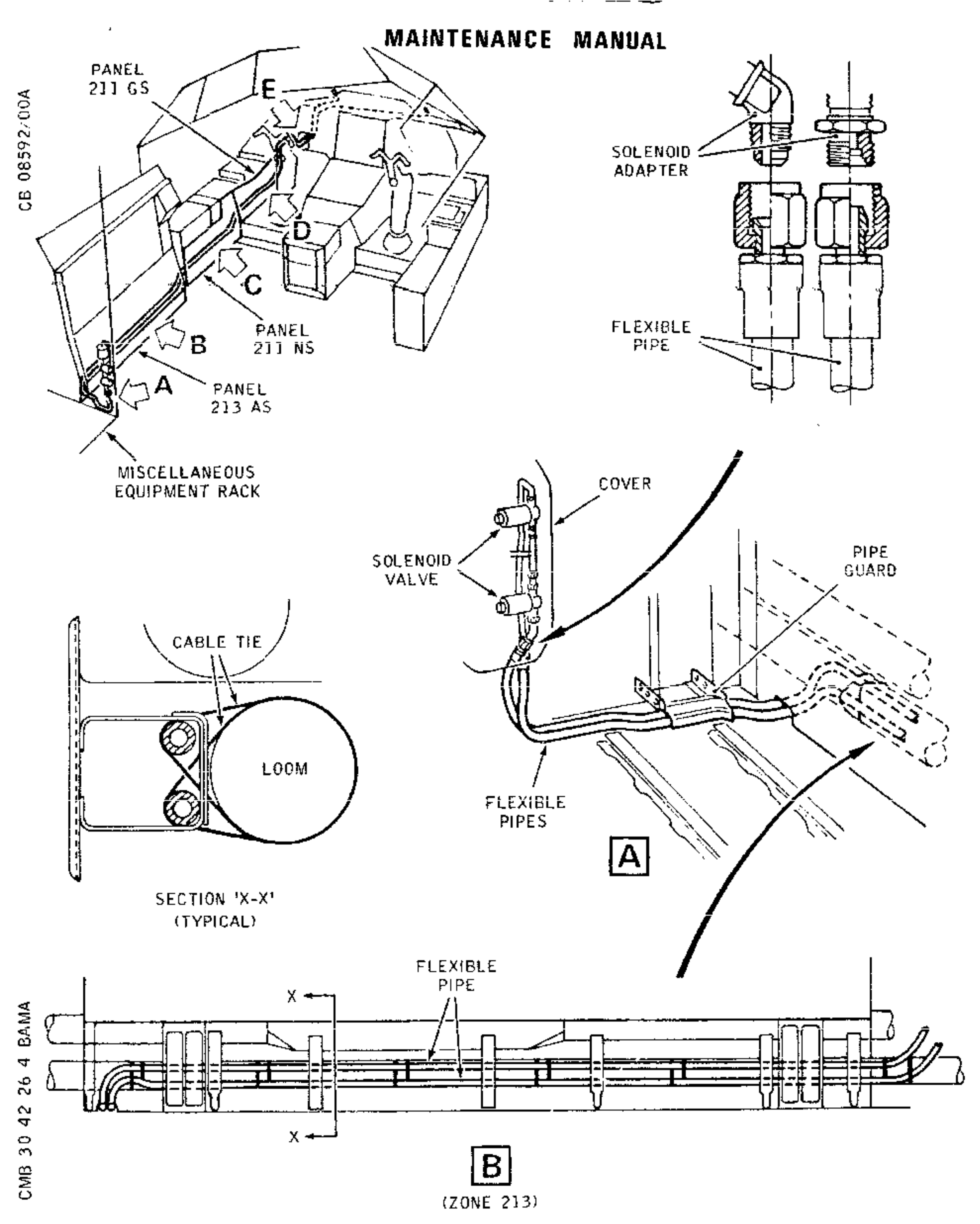
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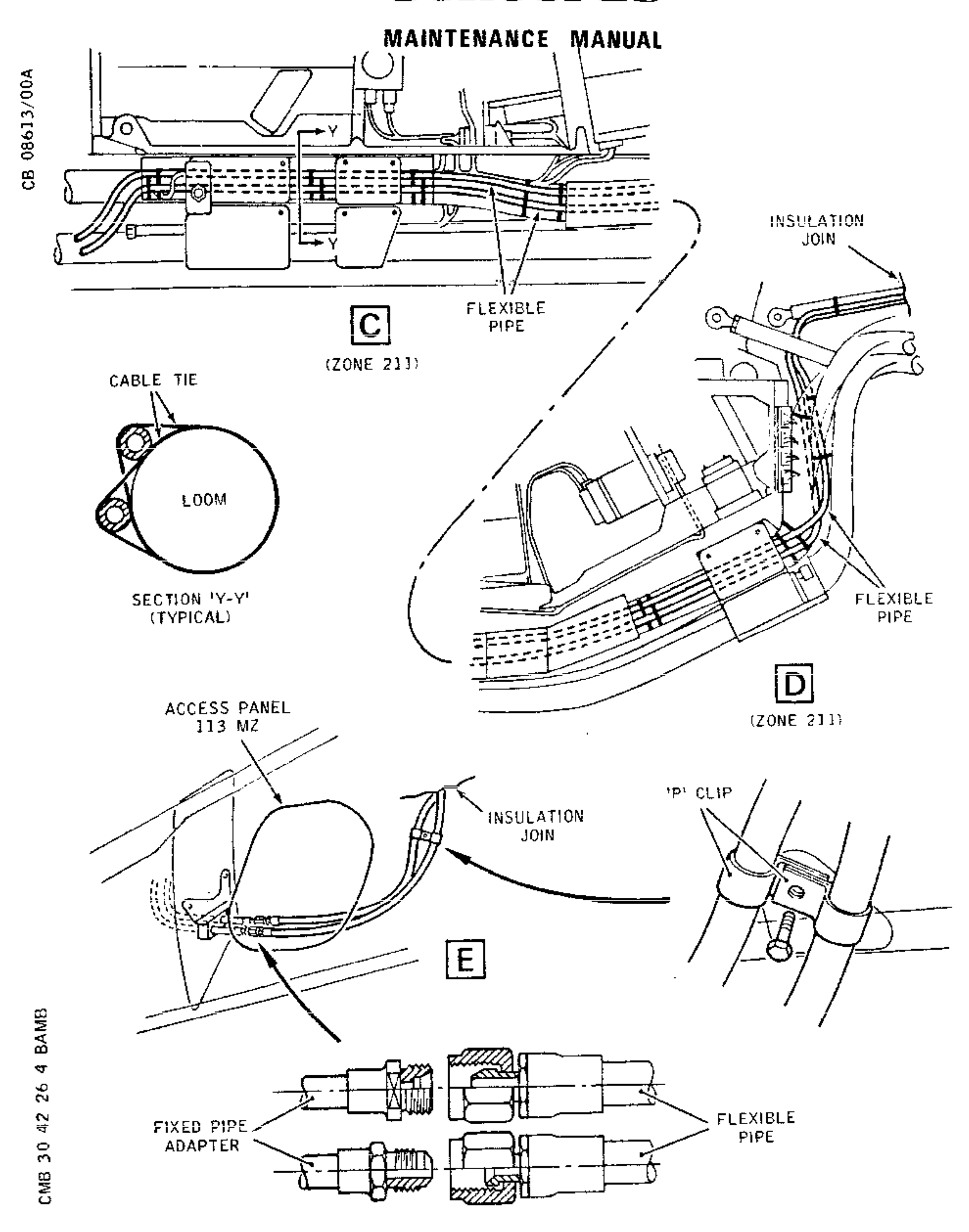
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Ground Locking Equipment
Figure 401

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF
VISOR & NOSE CONT	15-215	M11	F 8
NOSE 7 1/2 CONT	1-213	M12	Q16
NOSE/VISOR STBY			
LOWER SUP	1-213	M13	Q17
W/SCREEN WASH FLUID			
PUMP SYS SUP	15-215	H78	A10



Flexible Pipes - Installation
(Sheet 1 of 2)
Figure 402



Flexible Pipes - Installation
(Sheet 2 of 2)
Figure 402

(3) Fit the ground locking equipment to secure the visor or nose, as applicable, in the lowered position (Ref. Fig. 401):

(a) If only the visor is lowered, fit the ground locking link.

(b) If the nose is lowered fit the nose locking sleeves.

(4) Remove the cover from the windshield washer system components on the forward face of the miscellaneous equipment rack (Ref. Fig. 402).

C. Remove

(1) Disconnect the flexible pipes from the adapters at the solenoids. Be prepared to catch residual fluid draining from the pipes.

(2) Release the pipes from beneath the circuit breaker panel console structure:

(a) Remove panel 213 AS.

(b) Remove the cable ties securing the pipes to electrical loom M2.

(3) Release the pipes from beneath the LH side console:

(a) Release the Camloc fasteners securing side panels 211NS and GS and remove the panels.

(b) Remove the cable ties securing the pipes to electrical loom M1 and the instrument panel support strut.

(4) Disconnect the pipes at the forward pressure bulkhead:

(a) Remove the LH windshield wiper actuating arm (Ref.30-42-14, Removal/Inspection).

(b) Remove shutter fairing panel 113NZ.

(c) Remove access panel 113MZ in the pressure bulkhead.

(d) Remove the two P-clips securing the pipes to the bracket.

(e) Disconnect the pipes from the fixed pipe

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adapters. Be prepared to catch residual fluid draining from the adapters. Fit the blanks to the adapters and pipe ends.

(5) Remove the pipes.

D. Install

(1) Ensure that the safety precautions taken before removal still apply.

(2) Thread the two pipes in position beneath the circuit breaker panel structure and the side console with the forward ends passed through the insulation blankets to abutt the fixed pipe adapters at the pressure bulkhead (Ref. Fig. 402)

NOTE: The pipes, which are identical, have a different fitting at each end. Position the pipes so that one pipe has a different fitting to the other at the forward and rear ends. Keep the blanks fitted to the pipe ends while the pipes are being positioned.

(3) Remove the blanks and connect the pipes to the adap= ters at the pressure bulkhead. Torque tighten the pipe coupling nuts to between 170 and 190 lbf in (1.92 and 2.15 mdaN).

(4) Secure the pipes to the bracket with P-clips. Torque tighten the bolt to between 40 and 45 lbf in (0.45 and 0.50 mdaN).

(5) Connect the pipes to the adapters at the solenoids. Torque tighten the pipe coupling nuts to between 170 and 190 lbf in (1.92 and 2.15 mdaN).

(6) Secure the pipes to the electrical loom M2 beneath the circuit breaker panel structure (Zone 213) using cable ties.

(7) Secure the pipes to the electrical loom M1 and the support strut beneath the side console using cable ties. Position the pipes to the inboard or outboard face of the loom as convenient, but ensure maximum clearance with the 1st Pilot's seat electrical supply receptacle/connector (M575A).

(8) Reset the windscreen washer system supply circuit breaker H78 previously tripped.

(9) Carry out a windcreen washer system function test (Ref.32-40-00, Adjustment/Test) and check the pipe joints for leaks.

E. Conclusion

(1) Refit the access panels:

(a) ~~Panel 113MZ in the forward pressure bulkhead.~~

(b) Panel 113NZ in the shutter fairing.

(c) Panels 211NS and GS on the LH side console.

(d) Panel 213AS at the bottom of the circuit panel structure 213.

(e) Cover on the windshield washer system components on the forward face of the miscellaneous equipment rack.

(2) Refit the the windshield wiper arm (Ref.30-42-14, Removal/Installation).

(3) Remove the ground locking equipment from the visor or nose, as applicable, and refit the access panel.

(4) Reset the visor and droop nose circuit breakers previously tripped.

DRAIN MAST HEATING - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)

In low ambient temperatures, the water outlet pipes running through the three drain masts of the waste disposal system (Ref. 38-31-00) are heated by electrical heating elements, to prevent blockage by frozen water waste.

Each drain mast has its own control and indication circuit for the de-icing, and may be separately switched and tested.

The electrical supplies to the heating elements are controlled by mast heater selector switches, control relays and associated ADC slave relays. Additional control is effected by an associated landing gear weight switch relay which ensures that whenever the aircraft is on the ground the normal full voltage supply for the heating elements is replaced by a low voltage supply.

Indication of heating faults is provided for each individual mast by a failure warning caption on the flight compartment roof panel. Sensing of the faults is carried out by a.c. current sensors.

2. Control Relay (Ref. Fig. 002)

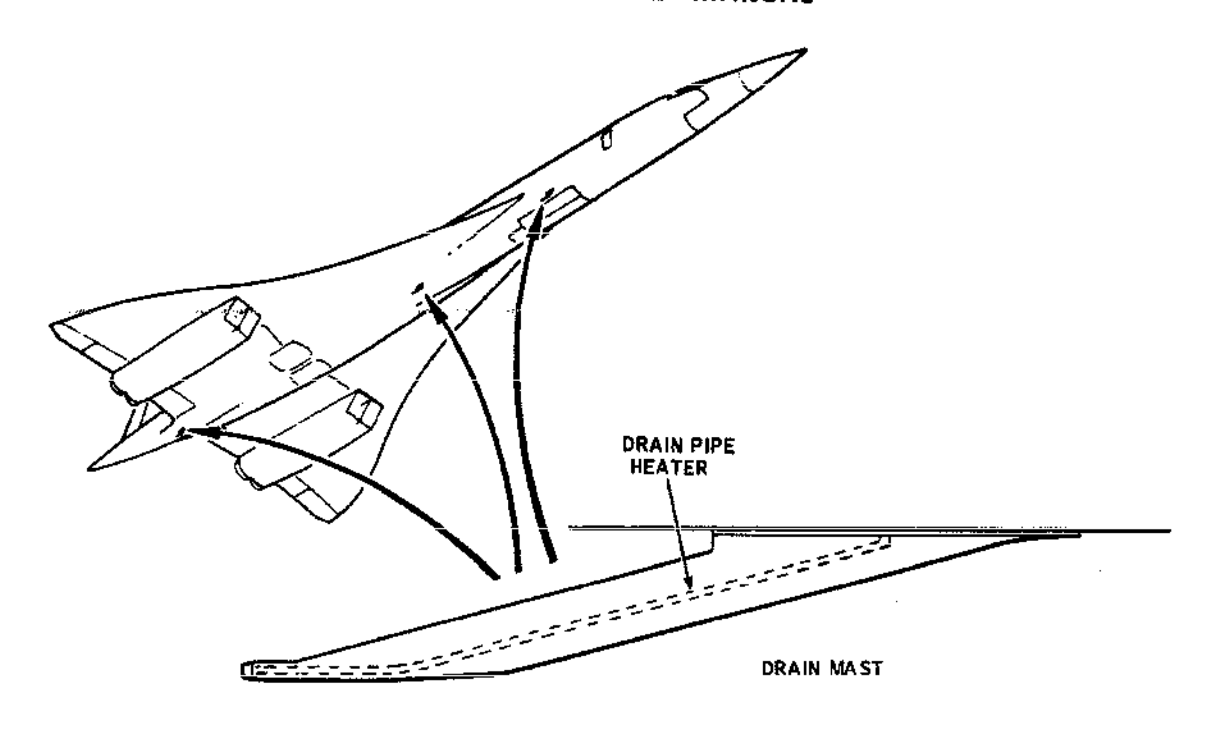
Three control relays, one for each de-icing circuit, are mounted one on panel 16-123 and two on panel 13-123. The relays effect control over the a.c. power supplies to the mast heater selector switches for eventual application to the heating elements, and are energized whenever power is applied and the aircraft total temperature is below +15 deg C.

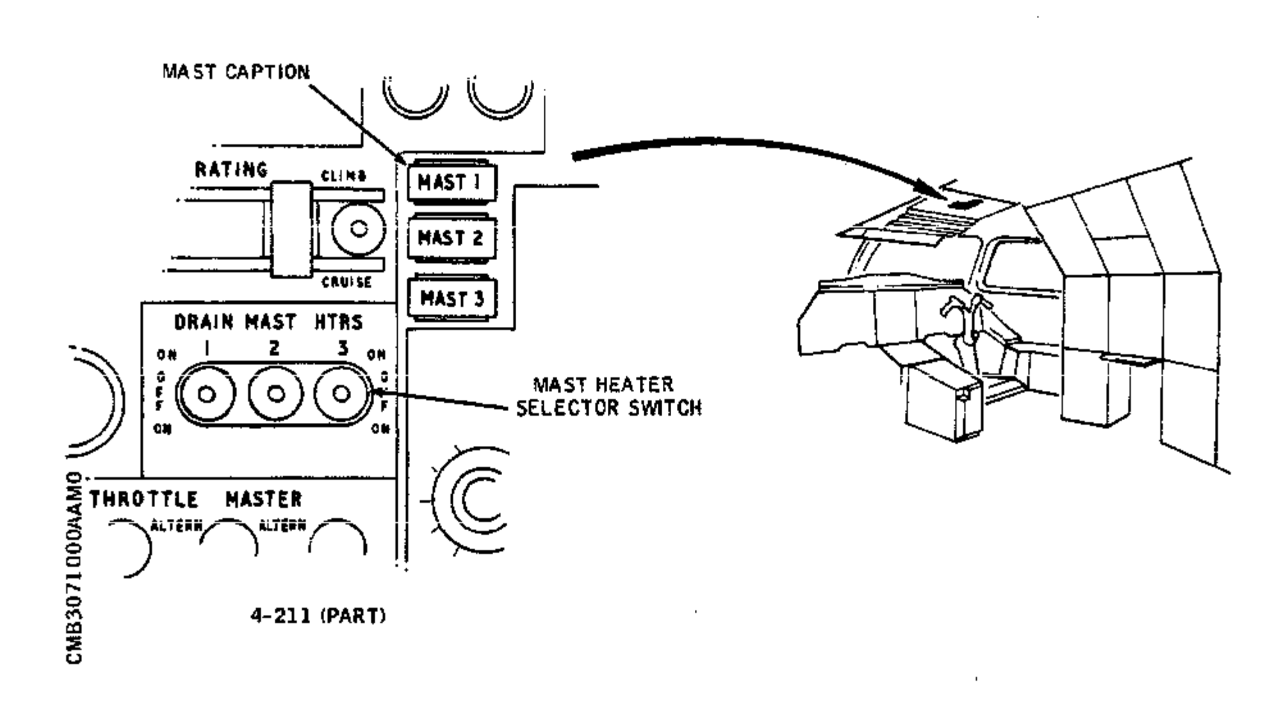
3. AC Current Sensor (Ref. Fig. 002)

Three a.c. current sensors, one for each heating circuit, are mounted one on panel 16-213 and two on panel 13-123, and are interposed in the supply lines to the heating elements to sense the input to each load.

Power for the associated load is applied via a transformer in each sensor which energizes an integral relay whenever the load current falls below a preset level. Contacts of this relay effect partial control over the associated failure warning caption on the roof panel.

4. Heating Elements





Drain Mast Heating
Figure 001

There are two heating elements in each drain mast. Either one of the elements is selected by an ON setting of the mast heater selector switch, the remaining element then being available as a standby.

5. Operation (Ref. Fig.001 and 002)

A. Control and Indication

The switches and indicators (captions) for the de-icing circuits are located on panel 4-211 in the flight compartment roof.

The caption filaments can be separately dimmed or tested using an associated switch (Ref. 33-14-00).

Three DRAIN MAST HTRS selector switches (ON - OFF - ON), numbered 1, 2 and 3 for the forward, centre and aft drain masts respectively, provide primary control of the mast heating. At each switch an ON position is used to select one of the two heating elements in each drain mast.

Three mast captions (MAST 1, MAST 2 and MAST 3) provide warning of a failure of the selected heating elements, and also provide a facility for testing the heating circuits.

B. Functional Description

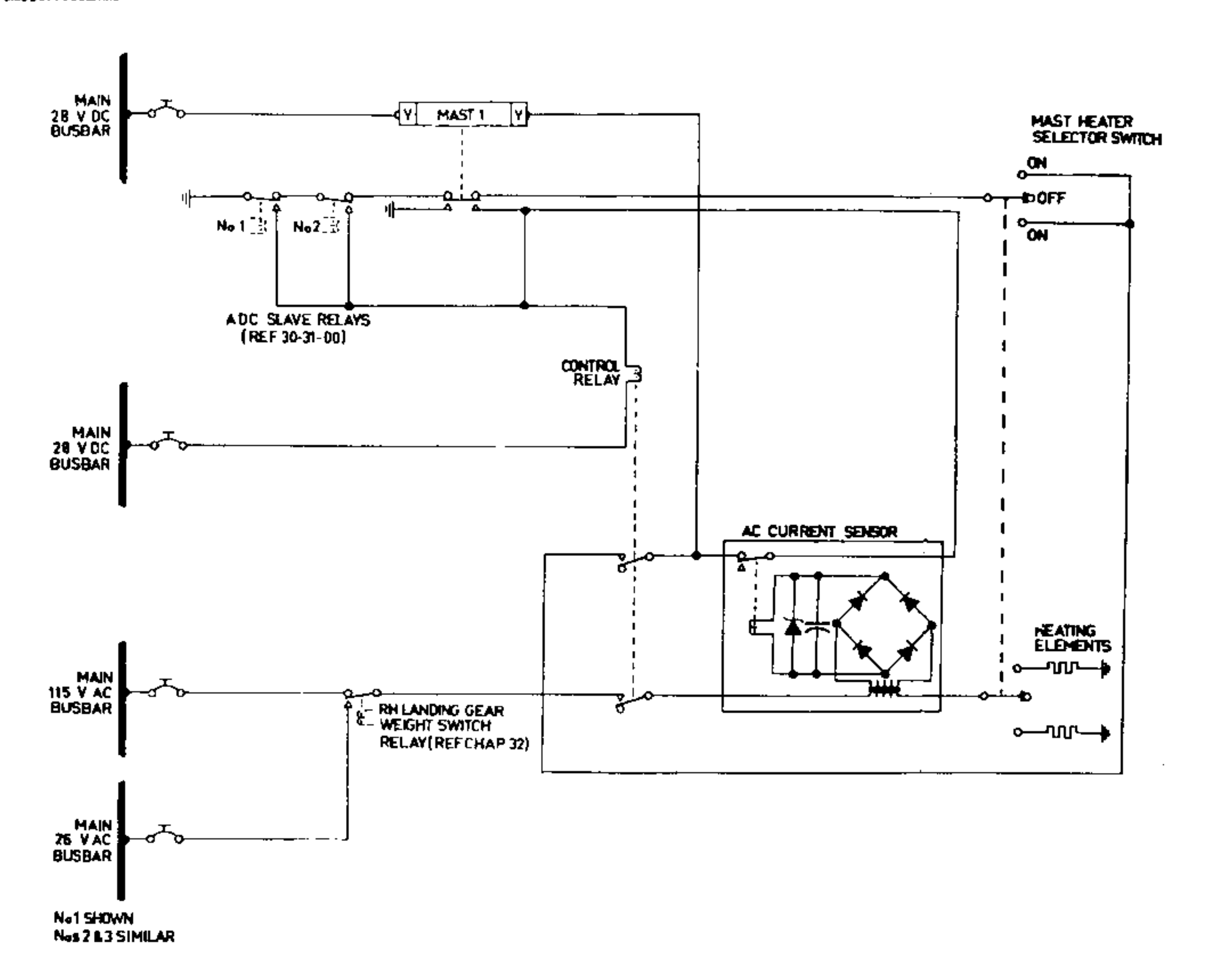
(1) Control Selection

To guard against overheating of the heating elements on the ground, contacts of an associated RH landing gear weight switch relay (Ref. Chap.32) replace the three separate 115 V a.c. supplies to the heating elements with a single 26 V a.c. supply.

The three heating circuits are similar in operation, therefore only one circuit is described.

Whenever the aircraft total temperature falls below +15 deg C, associated ADC temperature sensing systems energize No.1 and No.2 ADC slave relays (Ref. 30-31-00). Energization of either one of these relays in turn energizes the control relay, thus permitting operation of the heating via the mast heater selector switch. The heating is rendered inoperative with the subsequent de-energization of both

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Drain Mast Heating -
Simplified Schematic
Figure 002

ADC slave relays.

Under low temperature conditions, i.e., with the aircraft total temperature below +15 deg C, selection of an ON position at the mast heater selector switch routes the heater supply from the control relay contacts to the selected element.

(2) Failure Indication

The mast caption is supplied direct from a 28 V d.c. busbar, and is controlled by earth switching.

In the air or on the ground the mast heater selector switch is normally left at an ON position. For this reason the mast caption will be illuminated whenever the mast heater selector switch is left at the OFF position and the aircraft total temperature is below +15 deg C.

With the de-icing fully operative, i.e., with the mast heater selector switch set to an ON position, the aircraft total temperature below +15 deg C and the heating load correctly applied, the relay contacts in the a.c. current sensor will be open and failure warning will be inhibited.

If an abnormal current condition is sensed, caused either by an open-circuited element or a tripped circuit breaker, the relay contacts in the a.c. current sensor will close and illuminate the mast caption by completing the caption earth return via the ADC slave relay contacts.

Failure of a control relay to de-energize when the total temperature rises above +15 deg C causes the caption to be illuminated, provided that the mast heater selector switch has previously been left at an ON position. The earth return for the mast caption is routed from the ADC slave relay contacts to contacts of a switch integral with the mast caption, the mast heater selector switch and the 'stuck-on' control relay.

(3) Test Control

The main facility for testing the drain mast heating is a switch integral with the mast caption. By depressing the caption an earth is applied -

(a) to the control relay, to ensure that the relay is energized regardless of the total temperature, and

(b) to the a.c. current sensor contacts, for indication purposes.

Setting the mast heater selector switch to the OFF position and pressing the mast caption causes the caption to be illuminated, the earth from the caption switch being routed via the a.c. current sensor contacts. Conversely, setting the mast heater selector switch to an ON position and pressing the mast caption results in no illumination of the caption, provided the load is correctly applied.

C. Electrical Power Supplies

Electrical power is supplied from the busbars listed in Table 1.

SERVICE	BUSBAR	PANEL
Drain mast 1 control	'B' main 28 V d.c.	15-216
Drain mast 1 heater	No.4 main 115 V a.c.	14-216
Drain mast 1 anti-ice	No.4 main 115 V a.c.	14-216
Drain mast 2 & 3 control	'A' main 28 V d.c.	15-215
Drain mast 2 heater	No.1 main 115 V a.c.	14-215
Drain mast 2 anti-ice	No.1 main 115 V a.c.	14-215
Drain mast 3 heater	No.2 main 115 V a.c.	13-215

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SERVICE	BUSBAR	PANEL
Drain mast heaters (ground)	'A' main 26 V a.c.	13-215

Electrical Power Supplies
Table 1

DRAIN MAST HEATING - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. para.3.), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

The three drain mast heating circuits are essentially similar, therefore the procedures and charts are applicable to all. Where identical components are involved, i.e., one in each circuit, all three references to the associated components listed in Table 101 are given, e.g., Renew Caption Module (7), (8) or (9).

2. Preparation

A. Make available electrical ground power as detailed in 24-41-00.

B. Ensure that the associated circuit breakers are set (Ref. Table 101).

C. Ensure that the weight of the aircraft is on the landing gear, i.e., weight switches operated.

D. Ensure that all services liable to be adversely affected by the tripping of the two weight switch circuit breakers are effectively isolated (Ref. 7-11-00), except the drain mast heaters.

E. On panel 4-211, ensure that the wing and intake anti-icing MAIN and ALTERN selector switches and the ADS 1 and ADS 2 probe heaters switches are in the OFF position.

F. On panel 9-211, ensure that the ADC 1 and ADC 2 master switches are in the OFF position.

R

3. Trouble Shooting

```
   A.*****************************************
     *Prepare to trouble shoot (Ref. para.2.)*
R    *Ensure that the mast heater selector   *
R    *switch is set to the "OFF" position and*
     *check that the MAST caption is         *
     *extinguished.  IF -                    *
     *****************************************
                |           |
                |           |           --------------------------------
                |           |          |MAST caption illuminated with   |
               OK        NOT OK---|heater switched off above +15    |
                |                      |deg C - Chart 101.              |
                |                       --------------------------------
                |
   B.*****************************************
     *Press and release the MAST caption     *
     *and check that it is illuminated when  *
     *pressed.  IF -                         *
     *****************************************
                |           |
                |           |           --------------------------------
                |           |          |MAST caption not illuminated    |
               OK        NOT OK---|with heater switched off above   |
                |                      |+15 deg C and caption pressed - |
                |                      |Chart 102.                      |
                |                       --------------------------------
                |
   C.*****************************************
     *Set the Mast heater selector switch to *
     *an "ON" position and check that the    *
     *MAST caption remains extinguished.     *
     *IF -                                   *
     *****************************************
                |           |
                |           |           --------------------------------
                |           |          |MAST caption illuminated with   |
               OK        NOT OK---|heater switched on above +15     |
                |                      |deg C - renew Relay (10), (11)  |
                |                      |or (12). If fault does not      |
                |                      |clear, check wiring.            |
                |                       --------------------------------
```

D. *Press and release the MAST caption and check that it remains extinguished when pressed. IF -

OK

NOT OK --- MAST caption illuminated with heater switched on above +15 deg C and caption pressed - Chart 103.

E. *Set the mast heater selector switch to the alternative "ON" position, then press and release the caption and check that it remains extinguished when pressed. If -

OK

NOT OK --- MAST caption illuminated with alternative heater switched on above +15 deg C and caption pressed - Chart 104.

F. *For mast 1 only, trip and fit a safety clip to the RH UC WEIGHT SW B SYS SUP circuit breaker G294, panel 3-213, map ref. B9, then press the MAST caption for a maximum of 5 s and check that it is extinguished when pressed. IF -

OK

NOT OK --- MAST caption illuminated with heater switched on above +15 deg C, flight supply selected and caption pressed - Chart 105.

```
                  |
G.*****************************************
  *For mast 1 only, trip CB (3), then     *
  *press the MAST caption for a maximum   *
  *of 5 s and check that it is illuminated*
  *when pressed.  Reset CBs G294 and (3)  *
  *if OK.  IF -                           *
  *****************************************
                  |          |
                  |          |        -------------------------------
                  |          |       |MAST caption not illuminated   |
                  OK       NOT OK---|with heater switched on above  |
                  |                  |+15 deg C, flight supply failed|
                  |                  |and caption pressed - suspect  |
                  |                  |associated weight switch relay.|
                  |                  |For further trouble shooting,  |
                  |                  |refer to Chapter 32.           |
                  |                   -------------------------------
                  |
H.*****************************************
  *For mast 2 only, trip and fit a safety *
R *clip to the LH UC WEIGHT SW A SYS SUP  *
  *circuit breaker G292, panel 1-213, map *
  *ref.M17, then press the MAST caption   *
  *for a maximum of 5 s and check that it *
  *is extinguished when pressed.  IF -    *
  *****************************************
                  |          |
                  |          |        -------------------------------
                  |          |       |MAST caption illuminated with  |
                  OK       NOT OK---|heater switched on above +15   |
                  |                  |deg C, flight supply selected  |
                  |                  |and caption pressed - Chart 105.|
                  |                   -------------------------------
                  |
I.*****************************************
  *For mast 2 only, trip CB (4), then     *
  *press the MAST caption for a maximum of*
  *5 s and check that it is illuminated   *
  *when pressed.  Reset CBs G292 and (4)  *
  *if OK.  IF -                           *
  *****************************************
                  |          |
```


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```
           |         |
           |         |        ----------------------------------
           |         |       |MAST caption not illuminated      |
           OK       NOT OK---|with heater switched on above     |
           |                 |+15 deg C, flight supply failed   |
           |                 |and caption pressed - suspect     |
           |                 |associated weight switch relay.   |
           |                 |For further trouble shooting,     |
           |                 |refer to Chapter 32.              |
           |                  ----------------------------------
           |
   J.*****************************************
     *For mast 3 only, trip and fit a safety *
R    *clip to the LH UC WEIGHT SW & DOWNLOCK *
R    *B SYS SUP circuit breaker G293, panel  *
R    *3-213, map ref.B8, then press the MAST *
     *caption for a maximum of 5 s and check *
     *that it is extinguished when pressed.  *
     *IF -                                   *
     *****************************************
           |          |
           |          |       ----------------------------------
           |          |      |MAST caption illuminated with     |
           OK       NOT OK---|heater switched on above +15      |
           |                 |deg C, flight supply selected     |
           |                 |and caption pressed - Chart 105.  |
           |                  ----------------------------------
           |
   K.*****************************************
     *For mast 3 only, trip CB (5), then     *
     *press the MAST caption for a maximum of*
     *5 s and check that it is illuminated   *
     *when pressed.  Reset CBs G292 and (5)  *
     *if OK.  IF -                           *
     *****************************************
           |         |
           |         |        ----------------------------------
           |         |       |MAST caption not illuminated      |
           OK      NOT OK----|with heater switched on above     |
           |                 |+15 deg C, flight supply failed   |
           |                 |and caption pressed - suspect     |
           |                 |associated weight switch relay.   |
           |                 |For further trouble shooting,     |
           |                 |refer to Chapter 32.              |
           |                  ----------------------------------
           |
```

```
                    |
L.*****************************************
  *Set the ADC 1 master and ADC 1 - TEST  *
  *selector switches to the "ON" and "1"  *
  *positions respectively, then set the   *
  *mast heater selector switch to the     *
  *"OFF" position.  Allow time for the ADC*
  *to stabilize, then check that the MAST *
  *caption is illuminated.  IF -          *
  *****************************************
             |          |
             |          |         --------------------------------
             |          |        |MAST caption not illuminated    |
             OK         NOT OK---|with heater switched off below  |
             |                   |+15 deg C - Chart 106.          |
             |                    --------------------------------
             |
M.*****************************************
  *Return the ADC 1 master and ADC 1 -    *
  *TEST selector switches to the "OFF" and*
  *"NORM" positions, then set the ADC 2   *
  *master and ADC 2 - TEST selector       *
  *switches to the "ON" and "1" positions. *
  *Allow time for the ADC to stabilize,   *
  *then check that the MAST caption is    *
  *illuminated.  IF -                     *
  *****************************************
             |          |
             |          |         --------------------------------
             |          |        |MAST caption not illuminated    |
             OK         NOT OK---|with heater switched off below  |
             |                   |+15 deg C - suspect No.2 ADC    |
             |                   |slave relay.  For further       |
             |                   |trouble shooting, refer to      |
             |                   |30-31-00.                       |
             |                    --------------------------------
```

```
                 |
N.*****************************************
  *Return the ADC 2 master and ADC 2 -    *
  *TEST selector switches to the "OFF" and*
  *"NORM" positions respectively, then set*
  *the mast heater selector switch to an  *
  *"ON" position.  Apply an earth to term-*
  *inal D of the current sensor and check *
  *that the MAST caption is illuminated.  *
  *IF -                                   *
  *****************************************
                             |
                             |     --------------------------------
                             |    |MAST caption not illuminated    |
                        NOT OK----|with heater switched on above   |
                                  |+15 deg C. and control relay    |
                                  |'stuck' on (simulated) -        |
                                  |Chart 107.                      |
                                   --------------------------------
```

****
'MAST' CAPTION ILLUMINATED
*WITH HEATER SWITCHED OFF *
*ABOVE +15 deg C. *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Set the mast heater selector switch to the "OFF" position.

Set the other two mast heater selector switches to the "OFF" position. Are all three MAST captions illuminated?

-YES- Suspect No.1 or No.2 ADC slave relay. For further trouble shooting refer to 30-31-00.

NO

R Remove the connection and check
R for an earth 'output' at terminal 4 of the
R MAST caption module.

-YES- *Renew Caption Module (7), (8) or (9).

NO

Check aircraft wiring for stray earth between
R terminals 1 and 4 of MAST caption module.

Chart 101

****
*'MAST' CAPTION NOT ILLUMIN- *
*ATED WITH HEATER SWITCHED *
*OFF ABOVE +15 deg C AND *
*CAPTION PRESSED. *
****

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

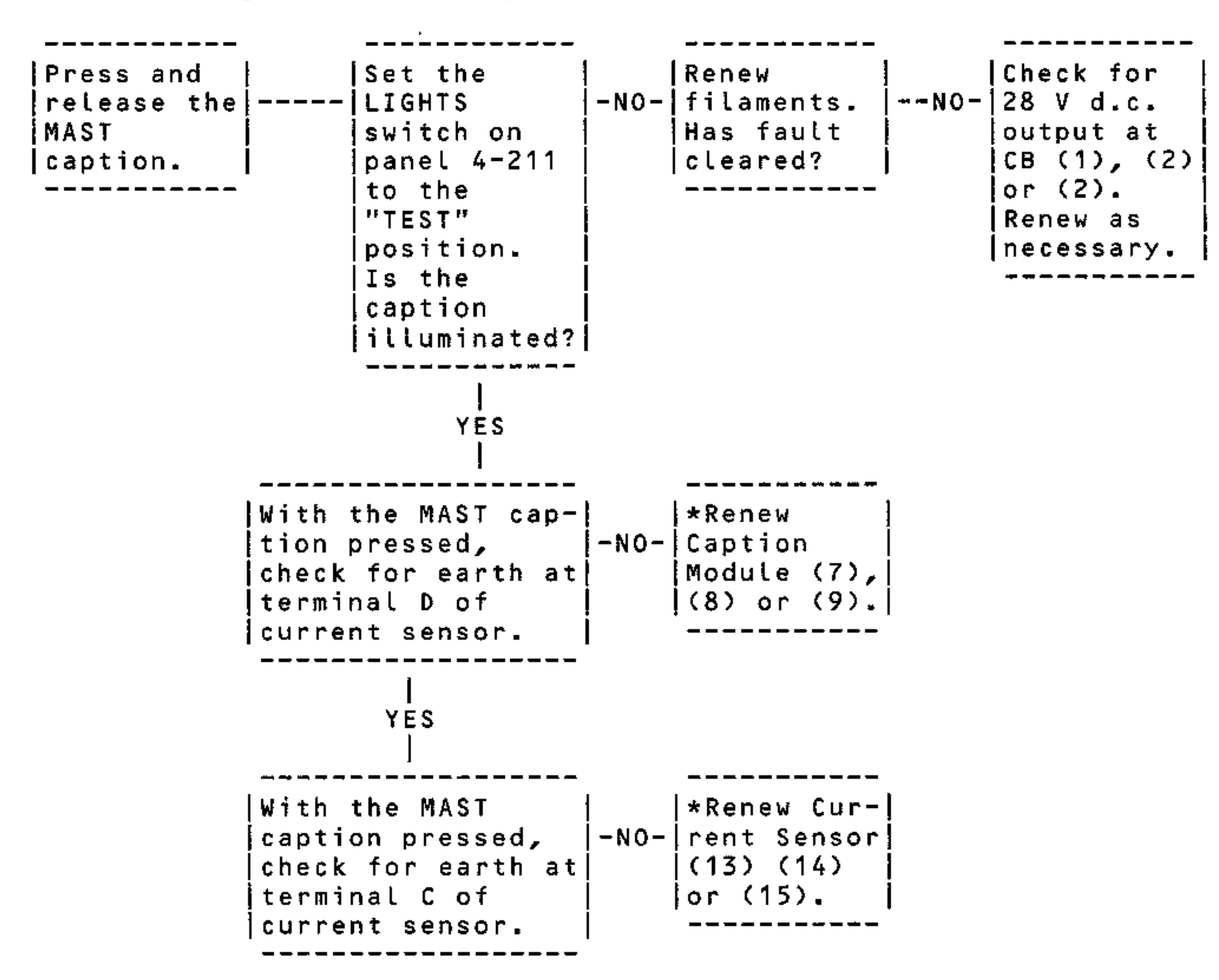


Chart 102

```
******************************
*'MAST' CAPTION ILLUMINATED  *
*WITH HEATER SWITCHED ON     *
*ABOVE +15 deg C AND CAPTION *
*PRESSED.                    *
******************************
```

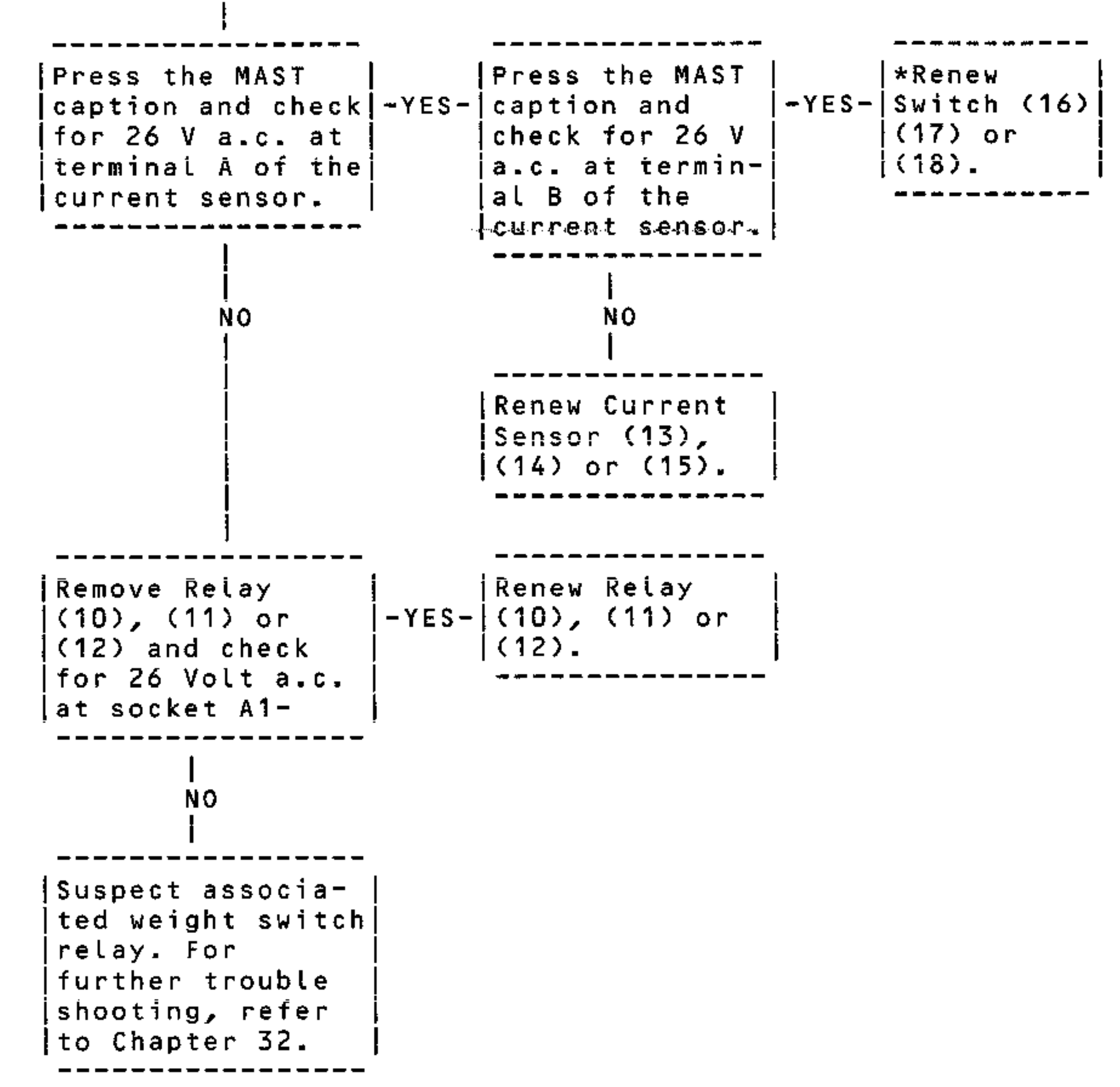
GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 ----------       -----------         -----------           ----------
|Press the |     |Set the mast|      |Return the  |        |*Renew Mast|
|MAST      |-----|heater sel- |-YES-|mast heater |-YES-|(19), (20) |
|caption.  |     |ector switch|      |selector    |        |or (21).   |
 ----------      |to the      |      |switch to   |         ----------
                 |alternative |      |the original|
                 |"ON position|      |"ON" posit- |
                 |and press   |      |ion. Press  |
                 |the MAST    |      |the MAST    |
                 |caption. Has|      |caption and |
                 |fault       |      |check for 26|
                 |cleared?    |      |V a.c. out- |
                  -----------        |put at term-|
                       |             |inal 1 or 3 |
                       |             |of mast     |
                       |             |heater sel- |
                       |             |ector switch|
                       |              -----------
                       |                   |
                       |                   NO
                       NO                  |
                       |              --------------
                       |             |*Renew Switch |
                       |             |(16),(17) or  |
                       |             |(18).         |
                       |              -----------
                ---------------       --------------
               |Check for similar|   |Check for 26 V |
               |fault on other   |-YES-|a.c. output at |
               |two mast heater  |   |CB (6). Renew  |
               |circuits.        |   |as necessary.  |
                ---------------       --------------
                     NO
                     |
             Continued on Sheet 2
```

Continued on Sheet 2

Chart 103 (Sheet 1 of 1)



R
R
R
R
R

Chart 103 (Sheet 2 of 2)

```
*****************************
*'MAST' CAPTION ILLUMINATED  *
*WITH ALTERNATIVE HEATER     *
*SWITCHED ON ABOVE +15 deg C *
*AND CAPTION PRESSED.        *
*****************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
 ----------------         ----------------         ----------------
|Set the mast    |       |With the MAST   |       |*Renew Mast (19).|
|heater selector |-------|caption pressed, |-YES-|(20) or (21).   |
|switch to the   |       |check for 26 V  |        ----------------
|alternative "ON"|       |a.c. output from|
|position and    |       |terminal 1 or 3 |
|press the MAST  |       |of the mast     |
|caption.        |       |heater selector |
 ----------------        |switch.         |
                          ----------------
                                 |
                                 NO
                                 |
                          ----------------
                         |*Renew Switch   |
                         |(16),(17) or    |
                         |(18).           |
                          ----------------
```

Chart 104

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'MAST' CAPTION ILLUMINATED WITH HEATER SWITCHED ON ABOVE +15 deg C, FLIGHT SUPPLY SELECTED AND CAPTION PRESSED.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

Trip and fit a safety clip to the appropriate weight switch CB, then press the MAST caption for a maximum of 5 s.

→ Check for 115 V a.c. output from CB (3), (4) or (5).

- YES → Suspect associated weight switch relay. For further trouble shooting, refer to Chapter 32.
- NO → Renew CB (3), (4) or (5).

Chart 105

'MAST' CAPTION NOT ILLUMINATED WITH HEATER SWITCHED OFF BELOW +15 deg C.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

Set the ADC 1 master and ADC 1 - TEST selector switch to the "ON" and "1" positions, respectively, then set the mast heater selector switch to the "OFF" position.

→ Set the ADC 2 master and the ADC 2 - TEST selector switches to the "ON" and "1" positions, respectively. Is MAST caption illuminated?

- YES → Suspect No.1 ADC slave relay. For further trouble shooting, refer to 30-31-00.
- NO → Check wiring between No.1 ADC slave relay and Current Sensor (13), (14) or (15).

Chart 106

'MAST' CAPTION NOT ILLUMINATED WITH HEATER SWITCHED ON ABOVE +15 deg C AND CONTROL RELAY 'STUCK' ON (SIMULATED).

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

R Return the ADC 2 master and ADC 2 - TEST selector switches to the "OFF" and "NORM" positions, respectively, then set the mast heater selector switch to an "ON" position. Apply an earth to terminal D of the current sensor.

Check for an earth 'input' to terminal 5 of mast heater the selector switch.
- YES: *Renew Switch (16),(17) or (18).
- NO: Check for an earth 'input' to terminal 6 of the MAST caption module.
  - YES: *Renew Caption Module (7), (8) or (9).
  - NO: Suspect No.1 or No.2 ADC slave relay. For further trouble shooting, refer to 30-31-00.

Chart 107

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(1) Circuit breaker 28 V	-	15-215	H1738	Map ref.B10	24-50-00 R/I	30-71-01
(2) Circuit breaker 28 V	-	15-216	H1723	Map ref.A17	24-50-00 R/I	30-71-02
(3) Circuit breaker 115 V	-	14-216	H1721	Map ref.E14	24-50-00 R/I	30-71-01
R **ON A/C 006-007,						
(4) Circuit breaker 115 V	-	14-215	H1722	Map ref.E6	24-50-00 R/I	30-71-02
**ON A/C 001-005,						
(4) Circuit breaker 115 V	-	14-215	H1722	Map ref.E7	24-50-00 R/I	30-71-02
**ON A/C ALL						
(5) Circuit breaker 115 V	-	13-215	H1732	Map ref.B10	24-50-00 R/I	30-71-03
(6) Circuit breaker 26 V	-	13-215	H1737	Map ref.E9	24-50-00 R/I	30-71-03
(7) MAST 1 caption module	-	4-211	H1768	Flt. compt. roof panel	30-00-00 R/I	30-71-01
(8) MAST 2 caption module	-	4-211	H1773	Flt. compt. roof panel	30-00-00 R/I	30-71-02
(9) MAST 3 caption module	-	4-211	H2041	Flt. compt. roof panel	30-00-00 R/I	30-71-03
(10) Control relay (mast 1)	-	16-123	H1740	RH ice relay box	30-00-00 R/I	30-71-01
(11) Control relay (mast 2)	-	13-123	H1766	LH ice relay box	30-00-00 R/I	30-71-02

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ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(12) Control relay (mast 3)	-	13-123	H2043	LH ice relay box	30-00-00 R/I	30-71-03
(13) AC current sensor (mast 1)	-	16-123	H1728	RH ice relay box	30-00-00 R/I	30-71-01
(14) AC current sensor (mast 2)	-	13-123	H1729	LH ice relay box	30-00-00 R/I	30-71-02
(15) AC current sensor (mast 3)	-	13-123	H1733	LH ice relay box	30-00-00 R/I	30-71-03
(16) Switch (mast 1)	-	4-211	H1769	Flt. compt. roof panel	30-00-00 R/I	30-71-01
(17) Switch (mast 2)	-	4-211	H1774	Flt. compt. roof panel	30-00-00 R/I	30-71-02
(18) Switch (mast 3)	-	4-211	H2042	Flt. compt. roof panel	30-00-00 R/I	30-71-03
(19) Drain mast 1	-	128	H1730	Fwd. belly	38-31-14 R/I	30-71-01
(20) Drain mast 2	-	132	H1731	Mid belly	38-31-14 R/I	30-71-02
(21) Drain mast 3	-	153	H1734	Aft belly	38-31-14 R/I	30-71-03

Component Identification
Table 101

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DRAIN MAST HEATING - ADJUSTMENT/TEST

CAUTION: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

The following Operational, Functional and System Tests check the integrity of the drain mast heating.

2. Operational Test

A. Prepare

(1) Make available electrical ground power as detailed in 24-41-00.

(2) Ensure that the ADC 1 and ADC 2 master switches (panel 9-211) are set to the OFF position.

B. Test

(1) Ensure that all three mast heater selector switches are set to the "OFF" position and check that the three MAST captions are extinguished (all on panel 4-211).

(2) Press and release each MAST caption in turn, checking that each is illuminated when pressed.

(3) Set each mast heater selector switch to an "ON" position and check that each MAST caption remains extinguished.

(4) Press and release each MAST caption in turn, checking that each caption remains extinguished when pressed.

(5) Set each mast heater selector switch to the alternative "ON" position, then press and release each MAST caption in turn, checking that each caption remains extinguished when pressed.

(6) Return the mast heater selector switches to the "OFF" position.

C. Conclusion

(1) Switch off and disconnect electrical ground power as detailed in 24-41-00.

3. Functional Test

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clip	-

B. Prepare

(1) Ensure that the weight of the aircraft is on the landing gear, i.e., weight switches operated.

(2) Ensure that all services liable to be adversely affected by the tripping of the weight switch circuit breakers are effectively isolated (Ref. 7-11-00), except for the drain mast heaters.

(3) Make available electrical ground power as detailed in 24-41-00.

C. Test

(1) Carry out an Operational Test (Ref. para.2.), omitting operation B.(6).

(2) Trip and fit a safety clip to RH UC WEIGHT SW 'B' SYS SUP circuit breaker G294, panel 3-213, map ref.B9.

(3) Press the MAST 1 caption for a maximum of 5 s; check that the caption is extinguished when pressed.

(4) Trip DRAIN MAST 1 HTR SUP circuit breaker H1721, panel 14-216, map ref.E14, then press the MAST 1 caption for a maximum of 5 s; check that the caption is illuminated when pressed.

(5) Reset circuit breakers G294 and H1721.

(6) Trip and fit a safety clip to LH UC WEIGHT SW 'A' SYS SUP circuit breaker G292, panel 1-213, map ref.M17.

R (7) Press the MAST 2 caption for a maximum of 5 s;
R check that the caption is extinguished when pressed.

(8) Trip DRAIN MAST 2 HTR SUP circuit breaker H1722, panel 14-215, map ref.E6, then press the MAST 2

caption for a maximum of 5 s; check that the caption is illuminated when pressed.

(8) Trip DRAIN MAST 2 HTR SUP circuit breaker H1722,
R panel 14-215, map ref.E7, then press the MAST 2 caption for a maximum of 5 s; check that the caption is illuminated when pressed.

(9) Reset circuit breakers G292 and H1722.

(10) Trip and fit a safety clip to LH UC WEIGHT SW & DOWNLOCK 'B' SYS SUP circuit breaker G293, panel 3-213, map ref.B8.

(11) Press the MAST 3 caption for a maximum of 5 s; check that the caption is extinguished when pressed.

(12) Trip DRAIN MAST 3 HTR SUP circuit breaker H1732, panel 13-215, map ref.B10, then press the MAST 3 caption for a maximum of 5 s; check that the caption is illuminated when pressed.

(13) Reset circuit breakers G293 and H1732.

(14) Set the ADC 1 master and test selector switches (panel 9-211) to the "ON" and "1" positions respectively.

(15) Allow time for the ADC to stabilize, then set the three mast heater selector switches to the "OFF" positions and check that the three MAST captions are illuminated.

(16) Return the ADC 1 master and test selector switches to the "OFF" and "NORM" positions respectively.

(17) Set the ADC 2 master and test selector switches (panel 9-211) to the "ON" and "1" positions respectively. Allow time for the ADC to stabilize, then check that the three MAST captions are illuminated.

(18) Return the ADC 2 master and test selector switches to the "OFF" and "NORM" positions respectively.

D. Conclusion

(1) Reinstate the weight switch services isolated during preparation.

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(2) Switch off and disconnect electrical ground power as detailed in 24-41-00.

4. System Test

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare

(1) Ensure that the weight of the aircraft is on the landing gear, i.e., weight switches operated.

(2) Ensure that all services liable to be adversely affected by the tripping of the weight switch circuit breakers are effectively isolated (Ref. 7-11-00), except for the drain mast heaters.

(3) Make available electrical ground power as detailed in 24-41-00.

C. Test

(1) Carry out an Operational Test (Ref. para.2.).

(2) Apply an earth to terminal D of a.c. current sensor H1728, panel 16-123 of the underfloor racking, and check that the MAST 1 caption is illuminated.

(3) Apply an earth to terminal D of a.c. current sensor H1729, panel 13-123 of the underfloor racking, and check that the MAST 2 caption is illuminated.

(4) Apply an earth to terminal D of a.c. current sensor H1733, panel 13-123 of the underfloor racking, and check that the MAST 3 caption is illuminated.

(5) Set each mast heater selector switch to an "ON" position.

(6) Carry out a Functional Test (Ref. para.3.), omitting operation C.(1).

D. Conclusion

(1) Reinstate the weight switch services isolated during preparation.

(2) Switch off and disconnect electrical ground power as detailed in 24-41-00.

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WATER SYSTEM ANTI-ICING - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001 and 002)

The potable water system pipes in zones 125 and 126, also the waste water system pipes in zones 128 and 153 are heated to prevent icing in low ambient temperatures. Electrically heated elements are used to heat the pipes and are controlled by the use of thermostats.

2. Heating Elements

The heating elements are in the form of a tape which is run in parallel with or wrapped spirally around the pipes. The heating elements, which are electrically insulated, are held in position by terylene thread prior to the fitting of thermal insulation around the pipes. The electrical connections to each heating element is by flying leads with crimped connectors.

As a number of tape heaters are required for each water system, they are connected in series with one another in each system. Pipe joints are provided with insulating muffs which also cover the electrical connections.
One of the elements is used to heat a pressure switch pipe.

After SB 38-010 For A/C 001-007,

The element used to heat the pressure switch pipe is deleted. The pressure switch and the pipe are also deleted.

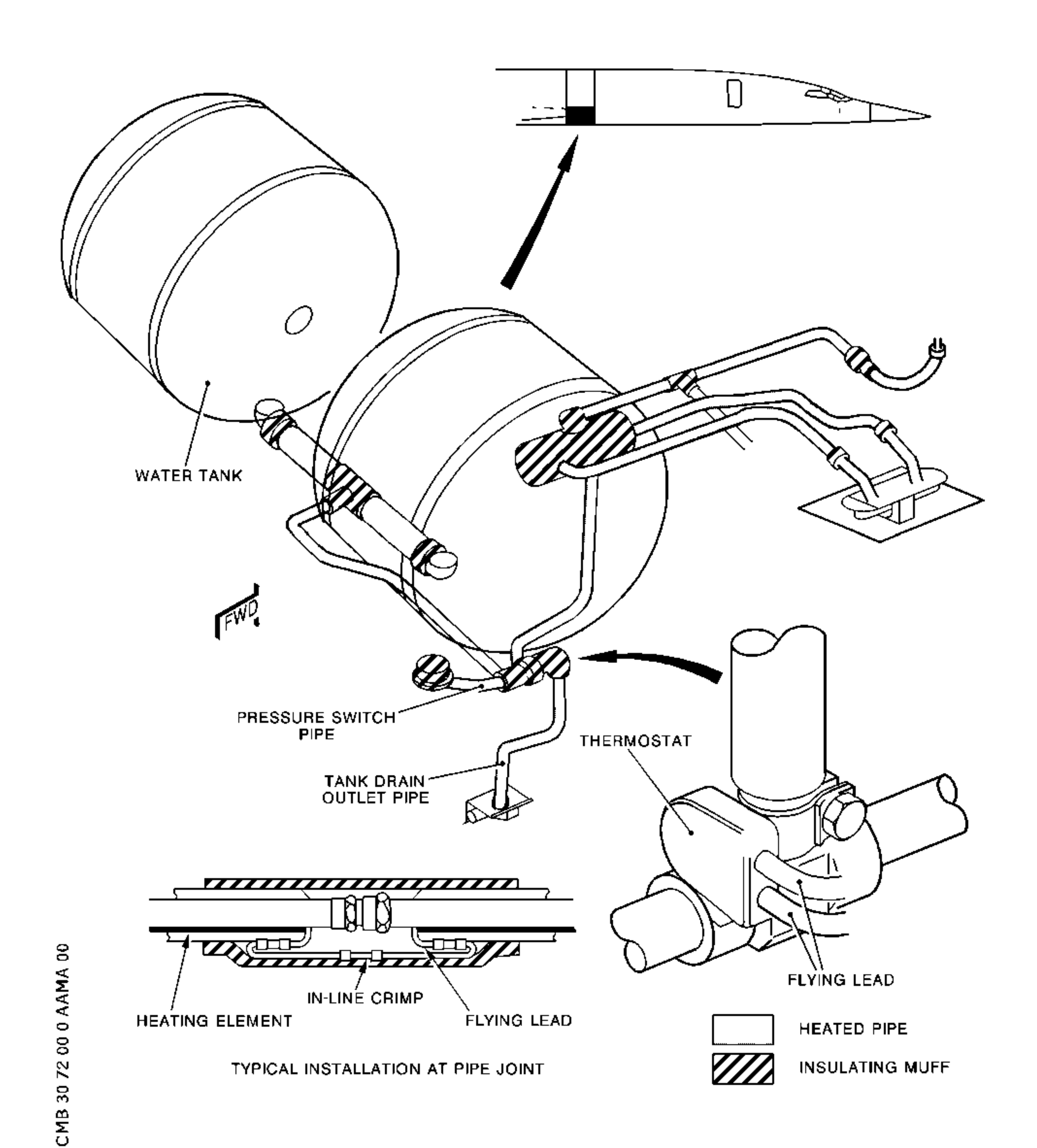
3. Thermostats

Control over the potable water pipe heating elements is effected by a thermostat. The thermostat is attached with a pipe clip to the lowest (coldest) part of the shuttle valve drain pipe.

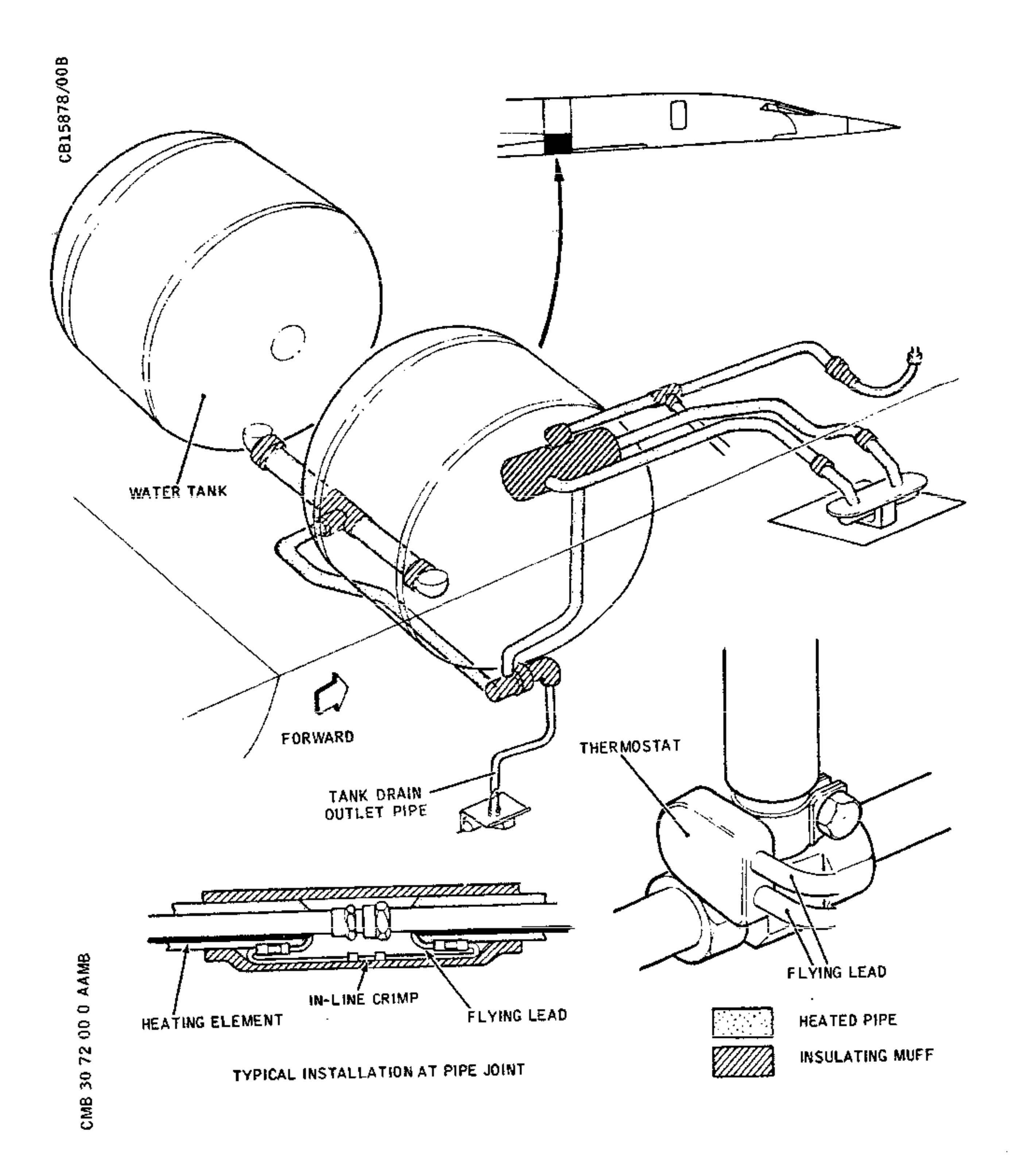
Control over the waste water pipe heating elements is also effected by a thermostat. This thermostat is attached with a pipe clip to the lowest part of the forward drain mast downpipe.

4. Change-over Relay (Ref. Fig. 003)

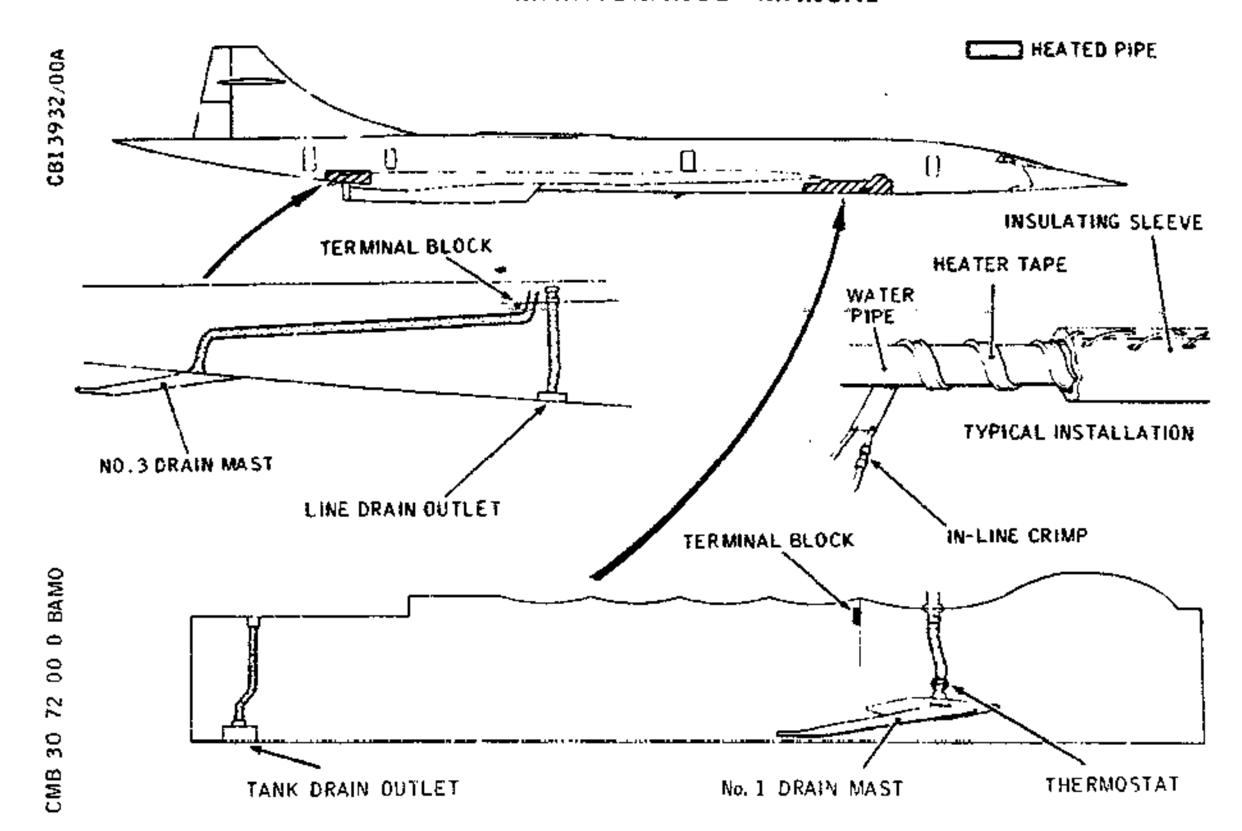
A change-over relay, mounted on panel 12-216 in the flight compartment right-hand racking, effects control over both the potable water system and the waste water system heater circuits. The relay ensures that the anti-icing systems will be operational whenever electrical power is applied to the aircraft.



Potable Water Pipe Heating - Location of Equipment -
Before SB 38-010 (Sheet 1 of 2)
Figure 001



Potable Water Pipe Heating - Location of Equipment - After SB 38 - 010 (Sheet 2 of 2)
Figure 001



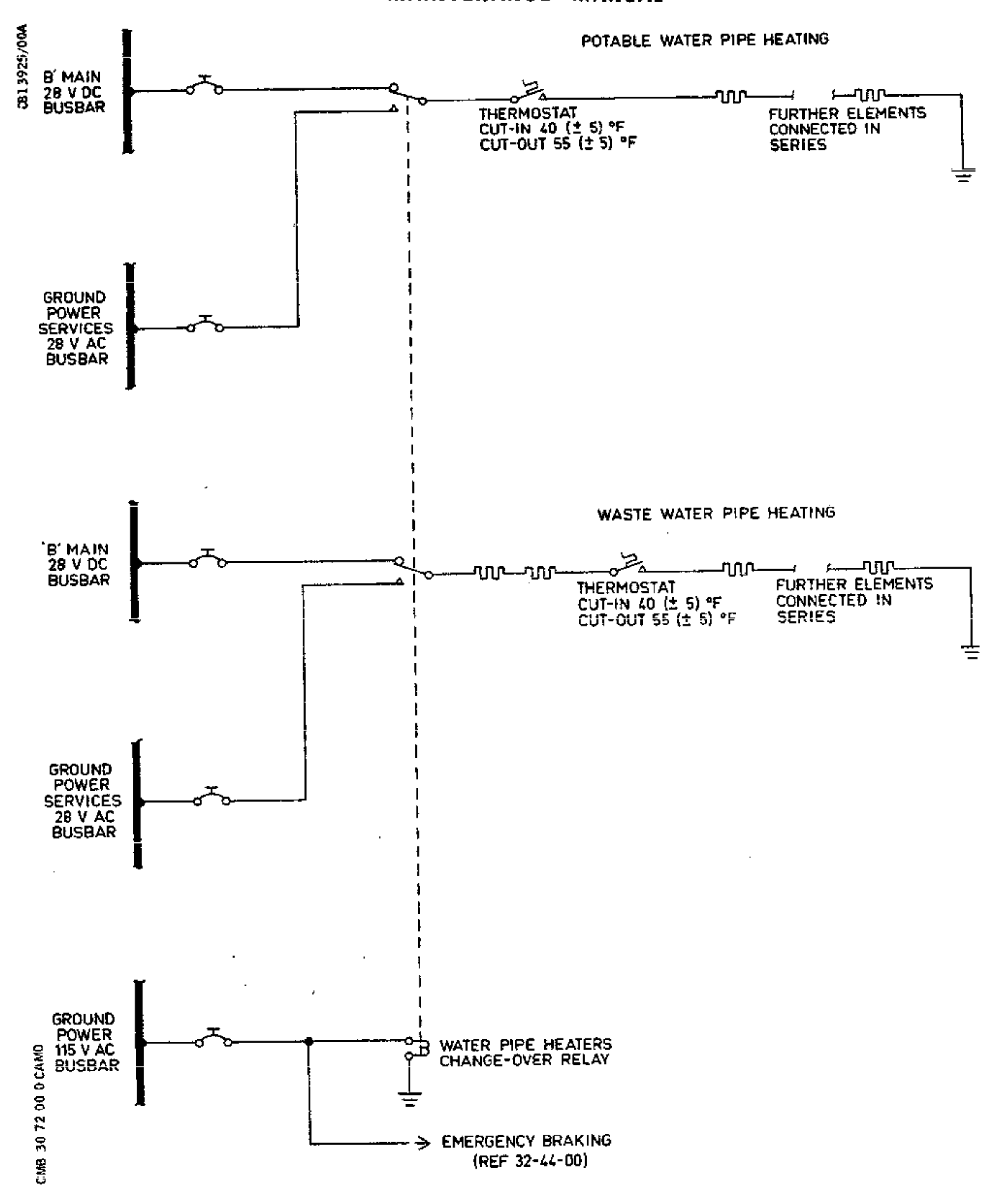
Waste Water Pipe Heating - Location of Equipment
R Figure 002

5. Operation (Ref. Fig. 003)

A. Functional Description

The electrical power supply for the heating elements is normally obtained from a main d.c. busbar via the normally closed contacts of the water pipe heaters change-over relay. However, the change-over relay is energized whenever electrical ground power is applied, and the supply, for the heating elements is obtained from the ground power services a.c. busbar.

If the temperature of the water pipes falls to between 35 and 45 deg F (1.62 and 1.78 deg C), the thermostat contacts close to complete the circuit to the heating elements. As a result, the elements heat the pipes and, as the temperature in the region of the thermostat reaches between 50 and 60 deg F (10.02 and 15.58 deg C), the thermostat contacts open, thus breaking the circuit to the heating elements.



Water Pipe Heating - Simplified Schematic
Figure 003

R

B. Electrical Power Supplies

Electrical power for the heating elements is supplied in the air from the 'B' main 28V d.c. busbar, and on the ground from the ground power services 28V a.c. busbar.

The change-over relay, together with the relays in the emergency braking system (Ref.32-44-00), is supplied, on the ground only from the ground power 115V a.c. busbar.

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WATER SYSTEM ANTI-ICING - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. paras.3. and 4.), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

2. Preparation

A. Potable Water System Heating

(1) Drain the potable water system (Ref. 12-36-00).

(2) Remove cabin floor panel 222 AA to gain access to module block UM1103 (Ref. 53-21-21).

R (3) Remove bulkhead panels 131 AS and 132 BS in the
R underfloor baggage compartment to gain access to zone
R 126.

(4) Make available electrical ground power as detailed in 24-41-00.

(5) Ensure that the associated circuit breakers are set (Ref. Table 101).

B. Waste Water Pipe Heating

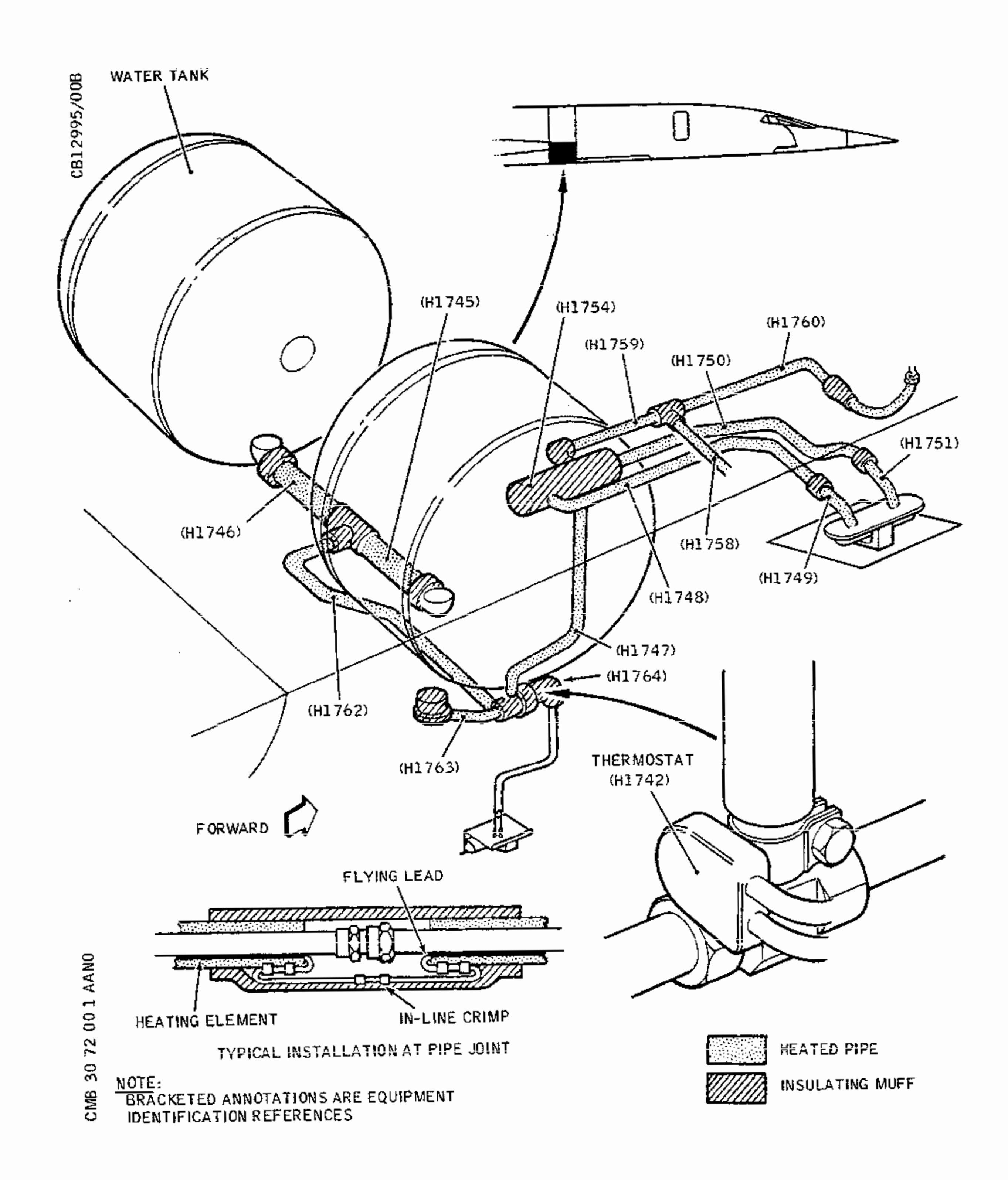
R (1) Observing all appropriate safety precautions, and
R open the nose landing gear doors (Ref. 32-00-00,
R Servicing).

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Ensure that the associated circuit breakers are set (Ref. Table 101).

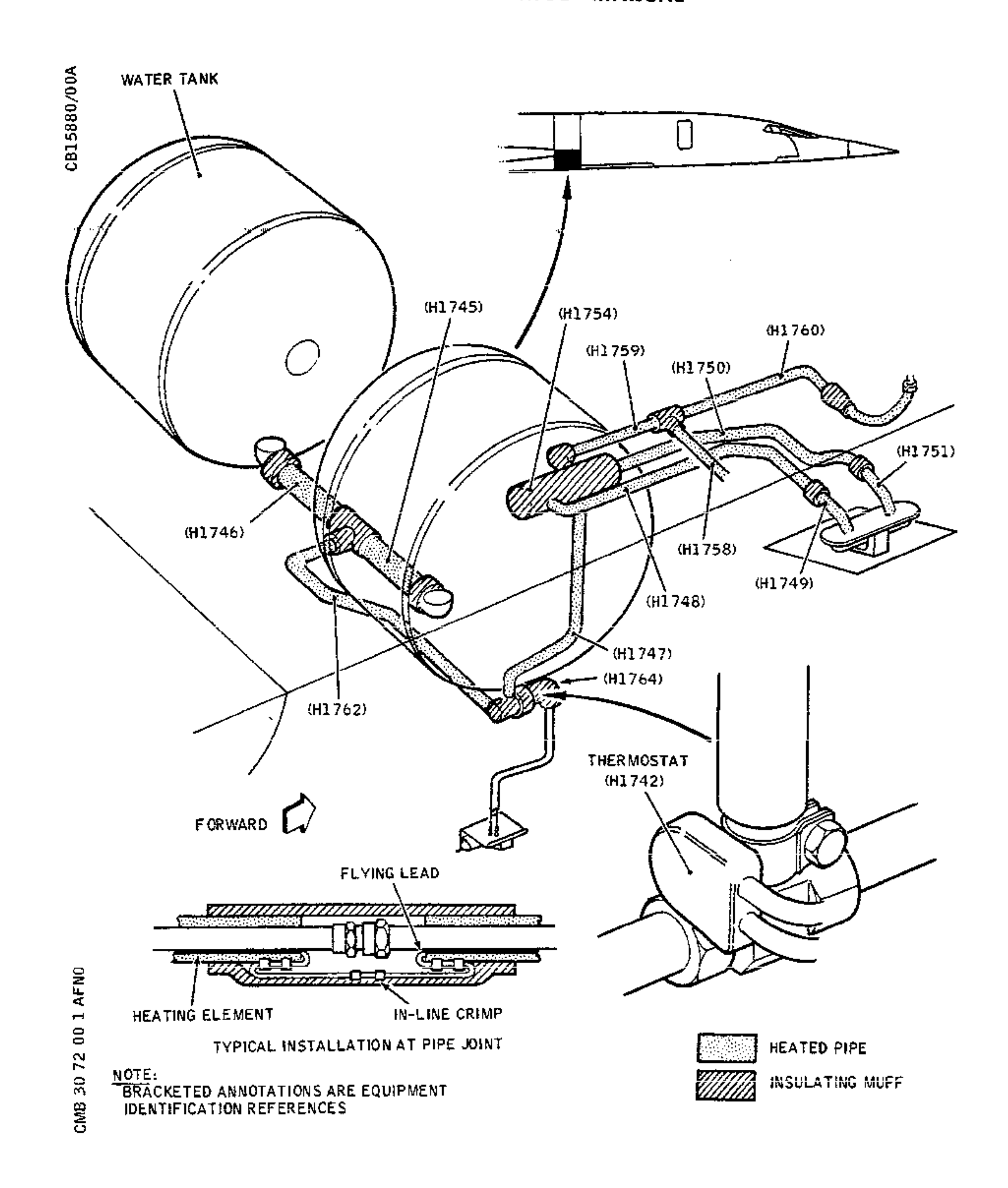
**ON A/C 001-005,

R **ON A/C 001-005,

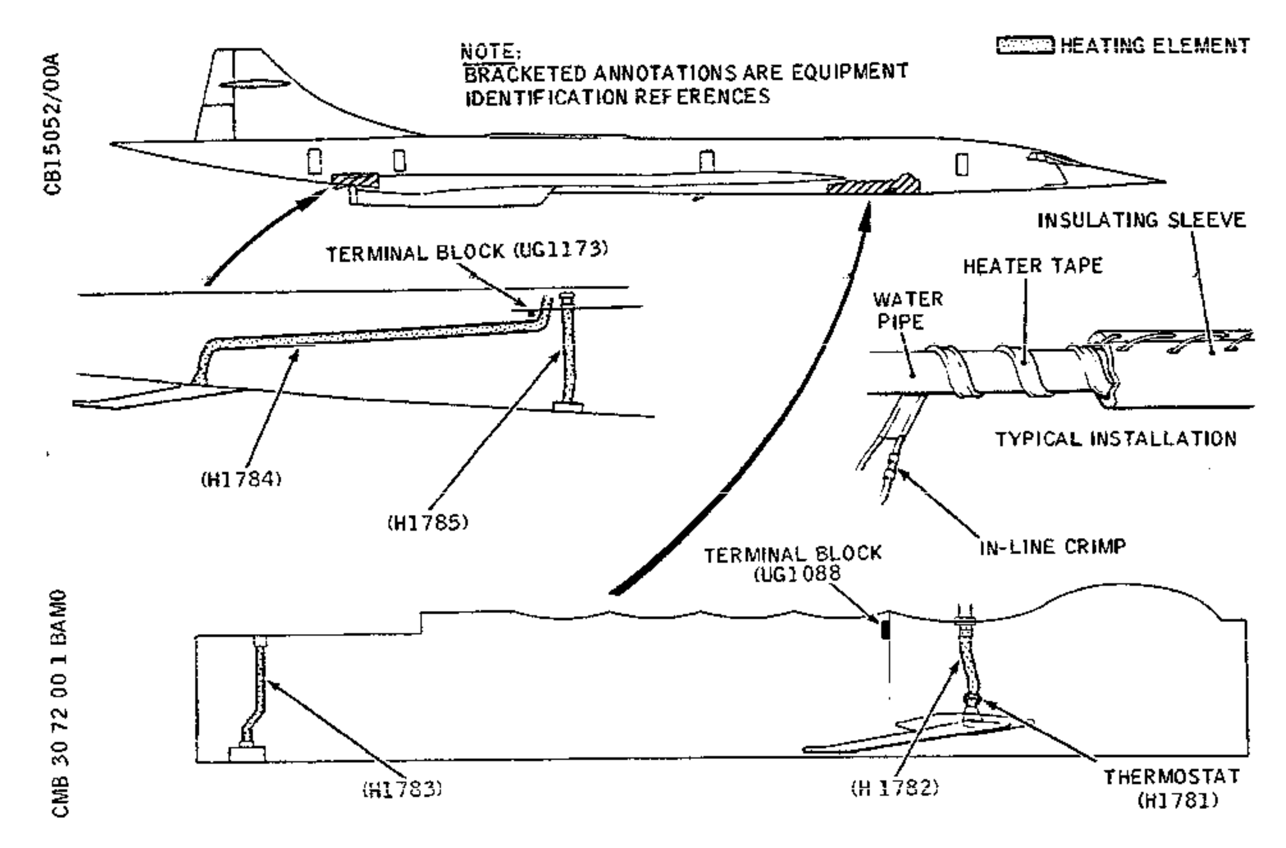


NOTE:
BRACKETED ANNOTATIONS ARE EQUIPMENT IDENTIFICATION REFERENCES

Potable Water Pipe Heating -
Location of Equipment - Before SB 38-010
Figure 101



Potable Water Pipe Heating -
Location of Equipment - After SB 38-010
Figure 102



- Waste Water Pipe Heating - Location of Equipment
Figure 103

3. Trouble Shooting - Potable Water Pipe Heating

```
A.********************************************
  *Prepare to trouble shoot (Ref. para.2.A.).*
  *Using a cooling or warming agent, as      *
  *required, carry out a Functional Test of  *
  *the potable water pipe thermostat         *
  *(Ref. 30-72-11, Adjustment/Test).  IF -   *
  ********************************************
            |    |
            |    |                 ----------------------------------
            OK   NOT OK-------|Renew Thermostat (3).              |
            |                      ----------------------------------
            |
B.********************************************
  *Release the cable from Module Block (4)   *
  *pin 5C, then check for continuity between *
  *the module block socket and aircraft      *
  *earth. IF -                               *
  ********************************************
            |    |
```

```
         |     |         ----------------------------------
         OK    NOT OK-------|Open circuit heating element -    |
         |                  |Chart 101.                        |
         |                   ----------------------------------
         |
C.**********************************************
  *Check the heating element supply and        *
  *current flow (Ref. Adjustment/Test,         *
  *2. Functional Test).  IF -                  *
  **********************************************
               |
               |         ----------------------------------
               NOT OK-------|Faulty heater supply circuit -    |
                            |Chart 102.                        |
                             ----------------------------------
```

4. Trouble Shooting - Waste Water Pipe Heating

```
A.********************************************
  *Prepare to trouble shoot (Ref. para.2.B.).*
  *Remove the cover from Terminal Block (9)  *
  *and check for 28 V a.c. at terminal 1 of  *
  *the block.  IF -                          *
  ********************************************
             |    |
             |    |          ---------------------------------
             |    |         |Faulty heater supply circuit -   |
            OK   NOT OK-----|Chart 103.                       |
             |               ---------------------------------
             |
B.********************************************
  *Refer to the applicable wiring diagram and*
  *disconnect the two thermostat flying leads*
  *from terminals 2 and 3 of Terminal Block  *
  *(9).  Check for continuity between the    *
  *heater wires on terminals 1 and 2 of the  *
  *terminal block.                           *
  *NOTE:  When the fault has been rectified, *
  *       all disconnected cables should be  *
  *       reconnected to the appropriate     *
  *       terminal block, with the           *
  *       connections made in accordance     *
  *       with the cable identifications and *
  *       the applicable wiring diagram.     *
  *       Torque-tighten terminal nuts to    *
  *       between 12 and 14 lbf in (0.137 and*
  *       0.158 mdaN).  IF -                 *
  ********************************************
             |    |
             |    |          ---------------------------------
             |    |         |Heating element H1782 open cir-  |
            OK   NOT OK-----|cuit - renew Heating Element (11).|
             |               ---------------------------------
             |
C.********************************************
  *Check for continuity between terminal 3   *
  *of Terminal Block (9) and aircraft earth. *
  *IF -                                      *
  ********************************************
             |    |
```

```
          |     |
          |     |      ----------------------------------
          |     |     |Wiring fault or open circuit      |
          OK    NOT OK-------|heating element H1783, H1784 or   |
          |           |H1785. Locate the fault, using the|
          |           |Wiring Diagram Manual as a guide. |
          |           |Correct faulty wiring or renew    |
          |           |Heating Element (11).             |
          |            ----------------------------------
          |
D.*******************************************
  *Using a cooling or warming agent, as      *
  *required, carry out a Functional Test of  *
  *the waste water pipe thermostat (Ref.     *
  *30-72-11, Adjustment/Test).  IF -         *
  *******************************************
                |
                |      ----------------------------------
                NOT OK-------|Renew Thermostat (8).             |
                       ----------------------------------
```

OPEN-CIRCUIT HEATING ELEMENT.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
MULTIMETER (E.G. AVOMETER)	-
PIN INSERTION/ REMOVAL TOOLS	-

Release the cable from Module Block (4) pin 5C, then check for continuity between the module block socket and aircraft earth.

→ Release the cable from module block pin 1A. Check for continuity between the module block socket and aircraft earth.

- NO → Using the Wiring Diagram Manual as a guide, locate the faulty element in the circuit between module block socket 1A and aircraft earth. Renew Element (5). Repeat test, then reconnect all cables to the module block.
- YES → Check for continuity between module block pin 5C and the released cable of module block pin 1A.
  - NO → Using the Wiring Diagram Manual as a guide, locate the faulty element in the circuit between module block socket 5C and the released cable of module block pin 1A. Renew Element (5). Repeat test, then reconnect all cables to the module block.

Chart 101

FAULTY HEATER SUPPLY CIRCUIT.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G. AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

```
-----------------      -----------------       -----------------
|Check the heating|    |Remove the       |     |*Renew Circuit   |
|element supply   |----|Change-over Relay|-NO--|Breaker (1).     |
|and current flow |    |(13) and check   |     |Repeat voltage   |
|(Ref. Adjustment/|    |for 28 V d.c. at |     |test then refit  |
|Test).           |    |pin A3 of the    |     |Change-over      |
-----------------      |relay socket.    |     |Relay (13).      |
                       -----------------       -----------------
                               |
                              YES
                               |
                       -----------------       -----------------
                       |Check for 28 V   |     |*Renew Circuit   |
                       |a.c. at pin A1 of|-NO--|Breaker (2).     |
                       |the relay socket.|     |Repeat voltage   |
                       -----------------       |test then refit  |
                               |               |Change-over      |
                              YES              |Relay (13).      |
                               |               -----------------
                       -----------------
                       |Check for 115 V  |     -----------------
                       |a.c. at pin X1 of|-NO--|*Renew Circuit   |
                       |the relay socket.|     |Breaker (12).    |
                       -----------------       |Repeat voltage   |
                               |               |test, then refit |
                              YES              |Change-over      |
                               |               |Relay (13).      |
                       -----------------       -----------------
                       |*Renew Change-   |
                       |over Relay (13). |
                       -----------------
```

Chart 102

FAULTY HEATER SUPPLY CIRCUIT

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G. AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

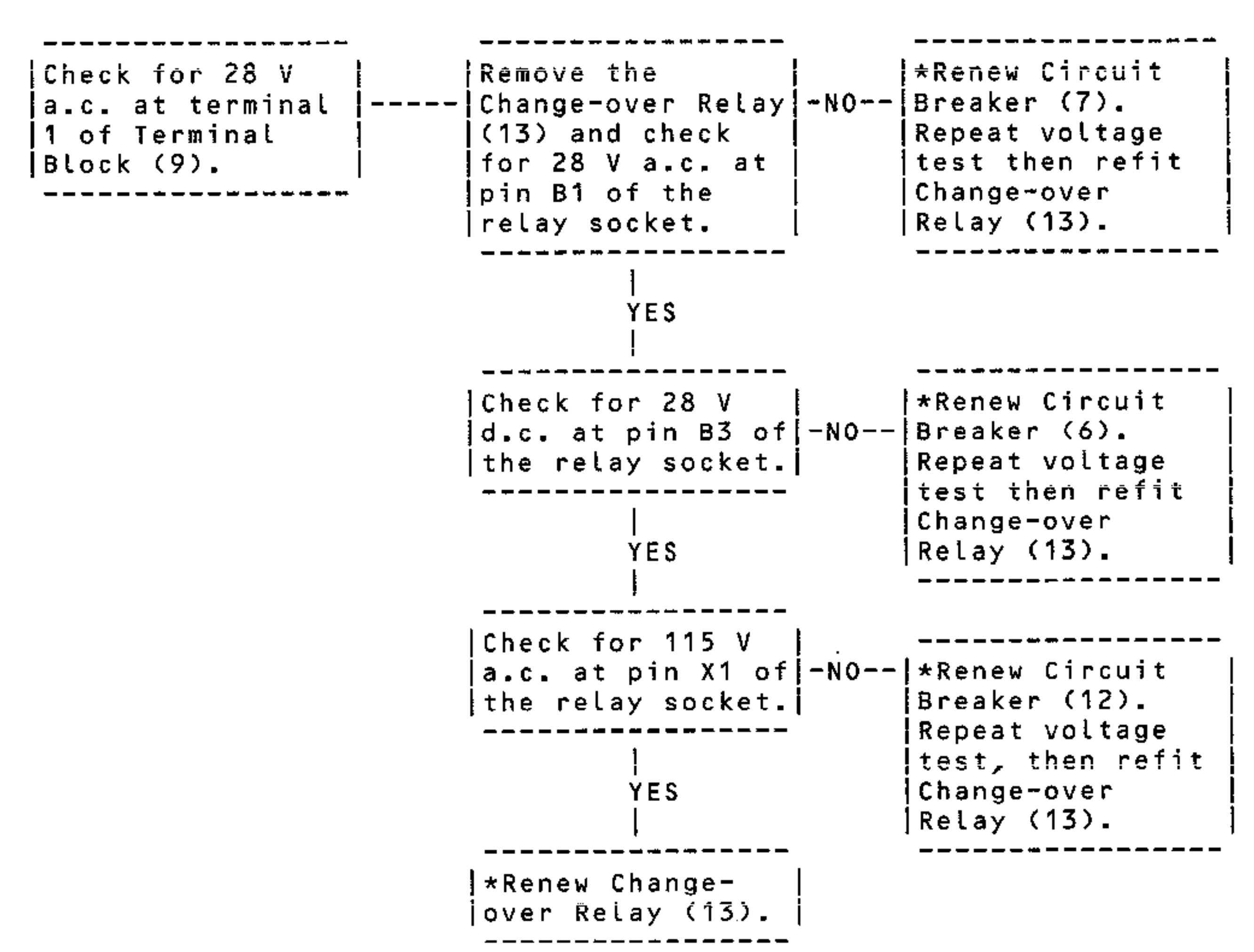


Chart 103

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
Potable water pipe heating components						
(1) Circuit breaker 28 V	-	15-216	H1741	Map ref.C17	24-50-00 R/I	30-72-01
(2) Circuit breaker 28 V	-	25-216	H1755	Map ref.C7	24-50-00 R/I	30-72-01
(3) Thermo-stat	132 BS	126	H1742	Ref.Fig.101	30-72-11 R/I	30-72-01
(4) Module block	222 AA	126	UM1103	Floor beam	-	30-72-11
(5) Heating elements	-	125/ 126	Ref. Fig. 101	Ref.Fig.101	38-11-00 R/I	30-72-01
Waste water pipe heating components						
(6) Circuit breaker 28 V	-	15-216	H1786	Map ref.A14	24-50-00 R/I	30-72-02
(7) Circuit breaker 28 V	-	25-216	H1787	Map ref.C8	24-50-00 R/I	30-72-02
(8) Thermo-stat	-	128	H1781	Ref.Fig.102	30-72-11 R/I	30-72-02
(9) Terminal block	-	128	UG1088	Ref.Fig.102	-	30-72-21
(10) Terminal block	153 FB	153	UG1173	Ref.Fig.102	-	30-72-21
(11) Heating elements	-/ 153 FB	128/ 153	Ref. Fig. 102	Ref.Fig.102	38-31-00 R/I	30-72-02
Associated components						
(12) Circuit	-	25-216	G119	Map ref.B7	24-50-00	32-44-01

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
breaker 115 V					R/I	
(13) Change-over relay	-	12-216	G122	Flight compartment RH racking	32-00-00 R/I	32-44-01

Component Identification
Table 101

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WATER SYSTEM ANTI-ICING - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

R These Functional Tests prove the integrity of the water
R pipe heaters change-over relay, together with the heating
R elements of the potable water pipes or the waste water pipes.
R Procedures for testing the thermostats are detailed in
R 30-72-11, Adjustment/Test.

Operational and System Tests are considered unnecessary in this application.

R 2. Functional Test - Potable Water Pipe Heating

A. Equipment and Materials

R

DESCRIPTION	PART NO.
Suitable testmeter (e.g., Avometer)	-
Pin insertion and removal tool(s)	-
Circuit breaker safety clips	-

R R R

R B. Prepare to Test Potable Water Pipe Heating

R (1) Remove panels 131 AS and 132 BS in the underfloor
R baggage compartment to gain access to zone 126.

(2) Remove cabin floor panel 222 AA to gain access to
R module block UM1103, which is mounted on a floor
R beam.

(3) Trip, and fit safety clips to, the following circuit breakers.

R R

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
WATER SYS HTR SUP 1	15-216	H1741	C17

R

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
WATER SYS ANTI-ICE HTRS SUP 1	25-216	H1755	C7
BRAKE EMER/ ACCUM/WATER PIPE HTR CONT	25-216	G119	B7

(4) At module block UM1103, disconnect and pull back the thermostat cables from sockets 5B and 5C.

(5) Set the testmeter to a range from 0 to at least 5 A d.c. then, using suitable adapters, connect the testmeter between sockets 5B and 5C of module block UM1103.

R C. Test Potable Water Pipe Heating

(1) Make available electrical ground power as detailed in 24-41-00.

(2) Reset circuit breaker H1741 and ensure that the testmeter indicates in the region of 1 to 4 A.

(3) Reset circuit breaker G119 and ensure that the testmeter indicates zero.

(4) Set the testmeter to a range from 0 to at least 5 A a.c., then reset circuit breaker H1755 and ensure that the testmeter again indicates in the region of 1 to 4 A.

(5) Trip, and fit safety clips to, circuit breakers H1741 and H1755.

D. Conclusion

(1) Disconnect and remove the testmeter, then reconnect the thermostat cables to module block UM1103, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

(2) Reset circuit breakers H1741 and H1755.

(3) Remove all tools and equipment from the working area.

(4) Refit panels 131 AS and 132 BS.

(5) Switch off and disconnect electrical ground power as detailed in 24-41-00.

(6) Refit the cabin floor panel as detailed in 53-21-21.

3. Functional Test - Waste Water Pipe Heating

A. Equipment and Materials

DESCRIPTION	PART NO.
Suitable testmeter (e.g., Avometer)	-
Torque spanner, 12 to 14 lbf in (0.137 to 0.160 mdaN)	ULTRA-WB808-6UNC
Circuit breaker safety clips	-

B. Prepare to Test Waste Water Pipe Heating

(1) Make available electrical ground power as detailed in 24-41-00.

(2) Observing all relevant safety precautions, open the nose landing gear doors (Ref. 32-00-00, Servicing).

(3) Trip, and fit safety clips to, the following circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
WATER SYS HTR SUP 2	15-216	H1786	A14
WATER SYS ANTI-ICE HTRS SUP 2	25-216	H1787	C8
BRAKE/EMER/ACCUM/WATER PIPE HTR CONT	25-216	G119	B7

R (4) At terminal block UG 1088, located on a vertical strut immediately aft of the thermostat in zone 128, disconnect and pull back the thermostat cables from terminals 2 and 3.

R (5) Set the testmeter to a range from 0 to at least 5 A d.c. then, using suitable adapters, connect the testmeter between terminals 2 and 3 of terminal block UG 1088.

R C. Test Waste Water Pipe Heating

R (1) Reset circuit breaker H1786 and ensure that the testmeter indicates in the region of 1.5 to 4.5 A.

R (2) Reset circuit breaker G119 and ensure that the testmeter indicates zero.

R (3) Set the testmeter to a range from 0 to at least 5 A a.c., then reset circuit breaker H1787 and ensure that the testmeter again indicates in the region of 1.5 to 4.5 A.

R (4) Trip, and fit safety clips to, circuit breakers H1786 and H1787.

R D. Conclusion

R (1) Disconnect and remove the testmeter, then reconnect the thermostat cables to terminal block UG 1088, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram. Torque-tighten the terminal nuts to between 12 and 14 lbf in (0.137 and 0.160 mdaN).

R (2) Reset circuit breakers H1786 and H1787.

R (3) Remove all tools and equipment from the working area.

R (4) Observing all relevant safety precautions, close the nose landing gear doors (Ref. 32-00-00, Servicing).

R (5) Switch off and disconnect electrical ground power as detailed in 24-41-00.

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WATER SYSTEM ANTI-ICING - INSPECTION/CHECK

1. General

A. There is a possibility of faults on the Water System heating tapes, in the nose landing gear bay and the rear hydraulic bay, which could result in hot spots or sparking without the activation of the associated circuit breakers. This dormancy feature, together with the risk of flammable fluid contaminating the lagging, is considered to be incompatible with the explosion proofness environmental category for these areas.

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2. Inspection

A. Pipes in Nose Landing Gear Bay, Zone 127/128.

(1) Open the nose landing gear bay doors (Ref. 32-00-00, Servicing).

(2) Locate the lagged drain pipe at the RH forward end of the nose landing gear bay between frames 20 and 21.

(3) Examine the outer cover of the lagging for cuts and any other signs of damage.

(4) Examine the exposed portions of the heating tape for signs of damage.

(5) Locate the lagged drain pipe at the RH rear end of the nose landing gear bay between frames 27 and 28.

(6) Examine the outer cover of the lagging for cuts and for any other signs of damage.

(7) Examine the exposed portions of the heating tape for signs of damage.

(8) If any damage is found during operations (3), (4), (6) and (7) carry out para. 3. Electrical Insulation and Continuity Check.

NOTE: The outer cover is repairable in accordance with 25-00-00 Approved Repairs.

(9) Examine inner lagging for signs of contamination with flammable liquids. Renew as necessary.

(10) Make certain the working area is clean and clear of tools and miscellaneous items of equipment.

(11) Close the nose landing gear bay doors (Ref. 32-00-00).

B. Pipes in Rear Hydraulic Bay, Zone 153/154

(1) Open access doors 153BB and 153DB.

(2) Locate the lagged drain pipe on the LH side of the rear hydraulic bay between frames 73 and 74.

(3) Examine the outer cover of the lagging for cuts and any other signs of damage.

(4) Examine the exposed portion of the heating tape for signs of damage.

(5) Locate the lagged drain pipe running from just forward of frame 74 to just aft of frame 77 in the rear hydraulic bay.

(6) Examine the outer cover of the lagging for cuts and any other signs of damage.

(7) Examine the exposed portions of the heating tape for signs of damage and signs of chafing where it is clipped to the structure.

(8) If any damage is found during operations (3), (4), (6) and (7) carry out para. 3. Electrical Insulation and Continuity Check.

NOTE: The outer cover is repairable in accordance with 25-00-00, Approved Repairs.

(9) Examine inner lagging for signs of contamination with flammable liquids. Renew as necessary.

(10) Make certain the working area is clean and clear of tools and miscellaneous items of equipment.

(11) Close access doors 153BB and 153DB.

3. Electrical Insulation and Continuity Check

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

THE ELECTRICAL INSULATION CHECK MUST BE CARRIED OUT USING AN INSTRUMENT OF THE SAME SAFETY STANDARD AS THE INSTRUMENT SPECIFIED.

A. Equipment and Materials

DESCRIPTION	PART NO.
Avometer	-
Shorting Link	-
Megohmeter Peekel Type WE678	-
Circuit breaker safety clips	-

B. Prepare

(1) Trip and safety the following circuit breakers:

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
WATER SYS HTR SUP 2	15-216	H1786	A14
WATER SYS ANTI-ICE HTRS SUP 2	25-216	H1787	C 8
BRAKE/EMER/ACCUM/WATER PIPE HTR CONT	25-216	G119	B 7

(2) Open access door 153BB.

(3) Open the nose landing gear bay doors (32-00-00, Servicing).

C. Check

(1) In rear hydraulic bay, Zones 153/154, disconnect and pull back cable H2729A from terminal 5 of terminal block UG.1173.

WARNING: AVOID MAKING CONTACT WITH EARTH.

(2) In nose landing gear bay, Zone 128, disconnect and pull back cable H2724C from terminal 1 of terminal block UG.1088.

(3) Disconnect and pull back thermostat cables H2725B and H2726A from terminals 2 and 3 of terminal block UG.1088.

(4) Connect a suitable shorting link across terminals 2 and 3 of terminal block UG.1088.

(5) Connect the Megohmeter between cable H2724C and earth.

(6) Carry out electrical insulation check of heating tapes.

NOTE: The megohmeter must show a reading greater than 2 Mohms.

(7) If the Megohmeter reading is less than 2 Mohms, locate the faulty heating tape using, if necessary, the Wiring Diagram Manual and replace with new heating tape.

NOTE: Connections to be made in accordance with Standards and Processes Manual, Chapter 20-41-22.

(8) If a heating tape is replaced, repeat operations (5) and (6) on the complete installation.

(9) Disconnect the Megohmeter and remove the shorting link from terminals 2 and 3 of terminal block UG.1088.

(10) In nose landing gear bay, reconnect cable H2724C to terminal 1 of terminal block UG.1088. Torque tighten the terminal nut to between 12 and 14 lbf in (0.136 and 0.158 mdaN).

(11) In rear hydraulic bay, reconnect cable H2729A to terminal 5 on terminal block UG.1173. Torque tighten the terminal nut to between 12 and 14 lbf in (0.136 and 0.158 mdaN).

(12) Make available electrical ground power (Ref. 24-41-00, Servicing).

(13) Set the testmeter to a range from 0 to at least 5 A d.c. Using suitable adaptors connect the testmeter between terminals 2 and 3 of terminal block UG.1088.

(14) Reset circuit breaker H1786 and ensure testmeter reading indicates between 1.5 and 4.5 A.

(15) Reset circuit breaker G119 and ensure testmeter indicates zero.

(16) Set the testmeter to a range from 0 to at least 5 A a.c.

(17) Reset circuit breaker H1787 and ensure testmeter reading indicates between 1.5 and 4.5 A.

(18) Trip and safety circuit breakers H1786 and H1787.

(19) Disconnect and remove testmeter.

(20) Reconnect cables H2725B and H2726A to terminals 2 and 3, respectively of terminal block UG.1088. Torque tighten the terminal nuts to between 12 and 14 lbf in (0.136 and 0.158 mdaN).

(21) Reset circuit breaker H1786 and H1787.

D. Close-Up

(1) Remove all tools and equipment used for the check from the nose landing gear bay and rear hydraulic bay. Ensure areas are clean and free from debris.

(2) Close access door 153BB.

(3) Close the nose landing gear bay doors (Ref. 32-00-00, Servicing).

(4) Switch off and disconnect the ground electrical power (Ref. 24-41-00, Servicing).

THERMOSTATS - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

The potable water pipe thermostat is attached to a water system pipe near the drain valve in zone 126. Access is gained after the removal of two panels at the forward end of the underfloor baggage compartment.

The waste water pipe thermostat is attached to a pipe directly above the No.1 drain mast, in zone 128. Access is gained by opening the nose landing gear doors.

2. Potable Water Pipe Thermostat

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

B. Prepare to Remove Potable Water Pipe Thermostat

(1) Trip and fit safety clips to the WATER SYS HTR SUP 1 circuit breaker H1741, panel 15-216, map ref.C17, and the WATER SYS ANTI-ICE HTRS SUP 1 circuit breaker H1755, panel 25-216, map ref.C7.

(2) Remove panels 131 AS and 132 BS in the underfloor baggage compartment to gain access to zone 126.

C. Remove Potable Water Pipe Thermostat

(1) Unclip the appropriate insulating muff to gain access to the thermostat.

(2) Disconnect the thermostat from the aircraft wiring by cutting the thermostat flying leads and aircraft cables as close as possible to the interconnecting in-line crimps.

(3) Remove the nut and bolt securing the thermostat to the pipe, then disengage the thermostat complete with flying leads.

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R D. Install Potable Water Pipe Thermostat

(1) Comply with the electrical safety precautions.

(2) Position the thermostat on the pipe, with the main body of the unit aft, then refit and tighten the nut and bolt.

(3) Reposition and fasten the insulating muff.

(4) Connect the thermostat flying leads to the aircraft electrical cables with in-line crimps (Ref. Wiring Diagram Manual, 20-42-12), ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram.

E. Conclusion

(1) Remove the safety clips and reset the circuit
R breakers tripped during preparation for test (Ref.
R para.2.B.(1)).

(2) Check the operation of the thermostat as detailed in Adjustment/Test.

R (3) Remove all tools and equipment from the working area.

R (4) Refit panels 131 AS and 132 BS in the underfloor
R baggage compartment.

R 3. Waste Water Pipe Thermostat

R A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clips	-

R B. Prepare to Remove Waste Water Pipe Thermostat

R (1) Trip and fit safety clips to the WATER SYS HTR SUP 2
R circuit breaker H1786, panel 15-216, map ref.A14 and
R the WATER SYS ANTI-ICE HTRS SUP 2 circuit breaker
R H1787, panel 25-216, map ref.C8.

R (2) Observing all relevant safety precautions, open the

R nose landing gear doors (Ref. 32-00-00, Servicing).

R C. Remove Waste Water Pipe Thermostat

R (1) Partially unlace the insulating muff to gain access
R to the thermostat securing nut and bolt.

R (2) Disconnect the thermostat flying leads from terminal
R block UG 1088, which is located on a vertical strut
R immediately aft of the thermostat.

R (3) Cut and remove the terminations from the thermostat
R flying leads, then carefully withdraw the leads from
R the cable loom. If necessary the cable ties may be
R removed, provided that a record is made of the colour
R coding and routing.

R (4) Remove the nut and bolt securing the thermostat to
R the pipe, then disengage the thermostat complete with
R flying leads.

R D. Install Waste Water Pipe Thermostat

R (1) Comply with the electrical safety precautions.

R (2) Position the thermostat on the pipe, with the main
R body of the unit outboard and the flying leads facing
R aft, then refit and tighten the nut and bolt.

R (3) Fasten the insulating muff with the lacing.

R (4) Route the thermostat flying leads through the cable
R loom to terminal block UG 1088, replacing cable ties
R as necessary.

R (5) Fit terminations to the flying leads as detailed in
R the Wiring Diagram Manual, 20-42-01.

R (6) Connect the thermostat flying leads to terminal block
R UG 1088, ensuring that the connections are made in
R accordance with the cable identifications and the
R applicable wiring diagram. Torque-tighten the
R terminal nuts to between 12 and 14 lbf in (0.136 and
R 0.158 mdaN).

R E. Conclusion

R (1) Remove the safety clips and reset the circuit breakers
R tripped during preparation for test (Ref. para.3.B.
R (1)).

R (2) Carry out a Functional Test of the thermostat as
R detailed in Adjustment/Test, but leave electrical
R ground power connected and switched on.

R (3) Remove all tools and equipment from the working area.

R (4) Observing all relevant safety precautions, close the
R nose landing gear doors (Ref. 32-00-00, Servicing).

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THERMOSTATS - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

The following Functional Tests prove that the thermostats ~~are operating, but not necessarily within their pre-set~~ operating range. Operational and System Tests are considered unnecessary in this application.

The potable water pipe thermostat is attached to a water system pipe near the drain valve, in zone 126. Access is gained after the removal of two panels at the forward end of the underfloor baggage compartment.

The waste water pipe thermostat is attached to a pipe directly above the No.1 drain mast, in zone 128. Access is gained by opening the nose landing gear doors.

2. Functional Test - Potable Water Pipe Thermostat

A. Equipment and Materials

DESCRIPTION	PART NO.
Current flow detector (e.g., clamp-on ammeter, typical range 0 to 5 A a.c.)	-
Cooling agent, e.g., solidified carbon dioxide (CO2), water ice, etc.	-
Plastic bag for containing cooling agent	-
Protective gloves (not required for water ice)	-
Supply of warm, dry air, or suitable alternative, for warming the thermostat	-

B. Prepare to Test Potable Water Pipe Thermostat

(1) Drain the potable water system (Ref. 12-36-00).

R (2) Remove panels 131 AS and 132 BS in the underfloor
R baggage compartment to gain access to zone 126.

R (3) Make available electrical ground power as detailed in 24-41-00.

R C. Test Potable Water Pipe Thermostat

(1) Unclip the appropriate insulating muff to gain access to the thermostat.

R (2) Position the current flow detector on one of the
R two thermostat flying leads.

NOTE: The following sequence of operations is based on the assumption that the thermostat is not currently subject to a temperature at, or below, the cut-in value. If, however, the thermostat temperature is below the cut-in value, first carry out operation
R (6) then carry out operations (3), (4),
R (5), (7) and (8).

WARNING: AVOID DIRECT CONTACT WITH SOLIDIFIED CARBON DIOXIDE, OTHERWISE SKIN BURNS WILL RESULT.

R (3) Using the protective gloves, as required, place some cooling agent in the plastic bag.

R (4) Wrap the plastic bag around the thermostat to reduce the temperature to below the cut-in value of 40(±5) deg F (4.4(±2.75) deg C), and check that
R the thermostat contacts close, i.e., the detector
R indicates a nominal current flow of 1 to 4 A.

R (5) Remove the plastic bag.

R (6) Using the warm, dry, air supply, increase the temperature to above the cut-out value of 55(±5) deg F (12.8(±2.75) deg C), and check that the thermostat contacts open, i.e., the heater current flow displayed by the detector ceases.

R (7) Remove the current flow detector.

R (8) Reposition and fasten the insulating muff.

D. Conclusion

(1) Remove all tools and equipment from the working area.

(2) Refit panels 131 AS and 132 BS.

(3) Switch off and disconnect electrical ground power as detailed in 24-41-00.

3. Functional Test - Waste Water Pipe Thermostat

A. Equipment and Materials

DESCRIPTION	PART NO.
Current flow detector (e.g., clamp-on ammeter, typical range 0 to 5 A a.c.)	-
Supply of very cold, ice-free water	-
Supply of hot water	-

B. Prepare to Test Waste Water Pipe Thermostat

CAUTION: IF THE OUTSIDE AIR TEMPERATURE IS AT OR BELOW 0 deg C, DISPLAY NOTICES TO PREVENT THE USE OF THE SINKS IN THE GALLEYS AND THE WASH BASINS IN THE TOILETS.

(1) Trip and fit a safety clip to the DRAIN MASTS HTR GRD SUP circuit breaker H1737, panel 13-215, map ref.E9.

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Observing all relevant safety precautions, open the nose landing gear doors (Ref. 32-00-00, Servicing).

C. Test Waste Water Pipe Thermostat

(1) Position the current flow detector on one of the two thermostat flying leads.

NOTE: In the following test, the thermostat is caused to function by passing hot or cooled water through the waste pipe to the drain mast outlet. If sufficient water is available, a free flow may be

R used. Alternatively, if water supplies are limited, the water should be allowed to pass through the drain mast to eliminate air-locks, and then trapped in the pipe by blocking the drain mast outlet with a suitable plug.

R The following sequence of operations is based on the assumption that the thermostat is not currently subject to a temperature at, or below, the cut-in value. If, however, the thermostat temperature is below the cut-in value, first carry out operations (4) and (5), then carry out operations (2), (3) and (6).

R (2) At the wash basin in the forward toilet, pour sufficient cooled water through the waste pipe to cause cooling of the thermostat to below the cut-in temperature of 40(±5) deg F (4.4(±2.75) deg C.). Allowing a short period for cooling of the pipe, check that the thermostat contacts close, i.e., the detector indicates a nominal current flow of 1 to 4.5 A.

R (3) Allow the waste pipe to empty itself through the drain mast.

R (4) At the wash basin in the forward toilet, pour sufficient hot water through the waste pipe to cause warming of the thermostat to above the cut-out temperature of 55(±5) deg F (12.8(±2.75) deg C). Allowing a short period for warming of the pipe, check that the thermostat contacts open, i.e., the heater current flow displayed by the detector ceases.

R (5) Allow the waste pipe to empty itself through the drain mast.

R (6) Remove the current flow detector.

R D. Conclusion

R (1) Reset the DRAIN MASTS HTR GRD SUP circuit breaker H1737, panel 13-215, map ref.E9.

R (2) Remove all associated tools, equipment and notices from the aircraft.

R (3) Observing all relevant safety precautions, close the nose landing gear doors (Ref. 32-00-00, Servicing).

TOILET DRAINS ANTI-ICING - DESCRIPTION AND OPERATION

R
1. General (Ref. Fig.001 and 002)

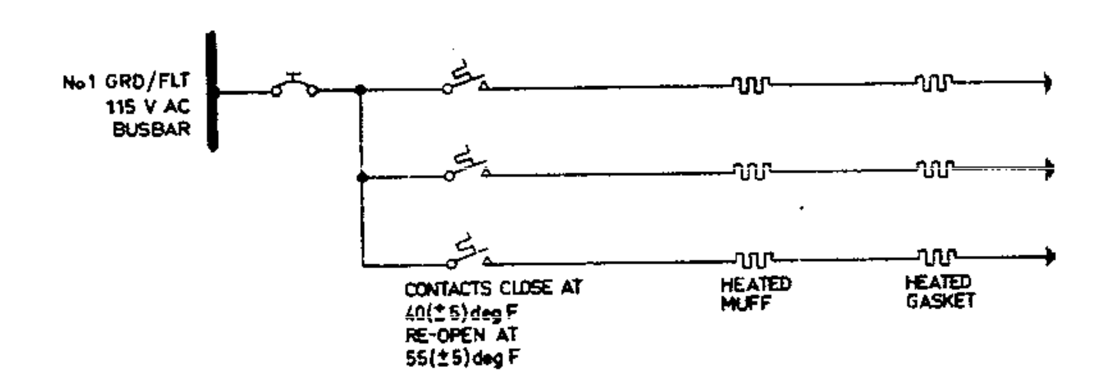
In low ambient temperatures the lower section of each toilet
R drain associated with the forward toilet and the centre
toilets is heated to prevent icing.

2. Heating Elements

The heating elements of each of the three drains comprise a clip-on muff wrapped around the lower stub pipe, and a gasket interposed between the drain cap assembly and the aircraft structure.

R

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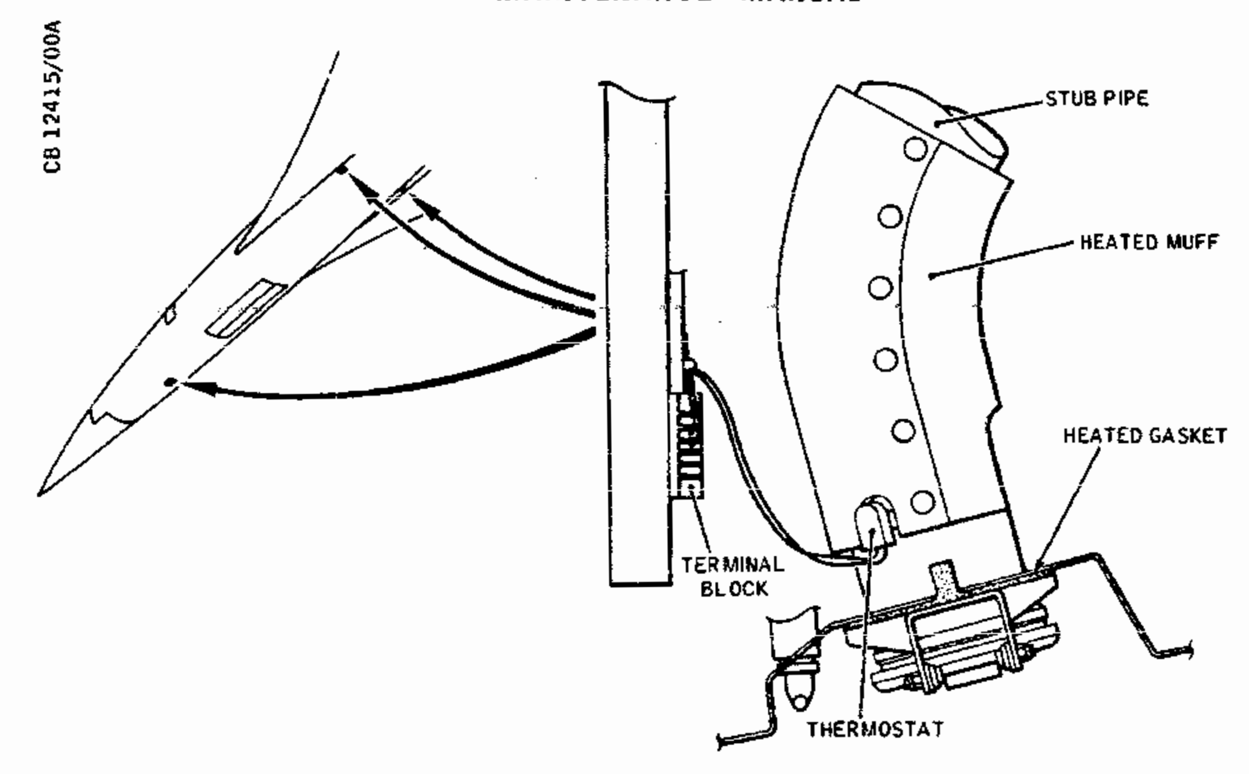


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Toilet Drain Heaters -
Simplified Electrical Schematic
R Figure 001

R
R
3. Thermostats

Control of the heating supplies is effected by thermostats



Heated Toilet Drains - Typical Installation
R Figure 002

which are attached with pipe clips to the lowest, i.e. coldest, part of the stub pipes.

4. Operation (Ref. Fig. 001)

A. Functional Description

If the temperature of a drain pipe falls to 40(+ or-5) deg F (4.4(+or-2.75) deg C), the associated thermostat contacts close to complete the circuit to the heating elements. As a result the elements heat the drain until the temperature of the pipe reaches 55(+or-5) deg F (12.8(+or-2.75) deg C), when the thermostat contacts open, thus breaking the circuit.

B. Electrical Power Supplies

Electrical power is supplied in the air or on the ground from the No.1 ground/flight 115 V a.c. busbar.

TOILET DRAINS ANTI-ICING - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. para.3.), and traced through OK and NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

The three toilet drain anti-icing circuits are similar, therefore the procedures and charts are applicable to all. Where three identical components are involved, i.e., one in each circuit, all three references to the associated components listed in Table 101 are given, e.g., 'Renew thermostat (2), (3) or (4)'.

2. Preparation

A. Make available electrical ground power as detailed in 24-41-00.

B. Ensure that the associated circuit breaker is set (Ref. Table 101).

C. Ensure that the associated toilet drain stub pipe has been drained of water waste.

R 3. Trouble Shooting

```
    ****************************************
 A.*Prepare to trouble shoot (Ref. para.2).*
   *Check for 115 V a.c. supply at terminal*
   *1 of associated terminal blocks,       *
   *located near thermostats.              *
    ****************************************
            |           |
            |           |      ---------------------------------
            |           |      |Check for open circuit between |
           OK           |-NOT OK - |terminals and circuit breaker  |
            |                  |(1). Rectify as necessary.     |
            |                  ---------------------------------
            |
    ****************************************
 B.*Perform a Functional Test of the      *
   *thermostats (Ref. 30-73-21, Adjustment/*
   *Test).                                 *
    ****************************************
            |           |
            |           |      ---------------------------------
           OK           |-NOT OK - |Renew thermostat (2), (3) or   |
            |                  |(4). Repeat test.              |
            |                  ---------------------------------
            |
    ****************************************
 C.*Perform a Functional Test of the system*
   *(Ref. Adjustment/Test).                *
    ****************************************
                        |
                        |      ---------------------------------
                        |      |1. Forward or right centre     |
                        |      |   toilet circuit inoperative -|
                        |-NOT OK - |   Chart 101.                  |
                               |2. Left centre toilet circuit  |
                               |   inoperative - Chart 102.    |
                               ---------------------------------
```

FORWARD OR RIGHT CENTRE TOILET CIRCUIT INOPERATIVE

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

Perform a Functional Test of the system (Ref. Adjustment/Test).

Check for correct earth at terminal 4 of associated terminal block.
- NO: Re-establish earth.
- YES: Check for 115 V a.c. at terminal 3 of associated terminal block.
  - NO: Renew heated muff (5) or (7).
  - YES: Renew heated gasket (8) or (10).

Chart 101

```
*******************************
*LEFT CENTRE TOILET CIRCUIT   *
*INOPERATIVE                  *
*******************************
```

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER	-

```
-----------------    ---------------------     ----------------
|Perform a      |    | Check for correct |  NO |Re-establish   |
|Functional Test|----| earth at terminal 3|----|earth.         |
|of the system  |    | of associated     |     ----------------
|(Ref. Adjustment|   | terminal block.   |
|/Test)..       |    ---------------------
-----------------              |
                              YES
                               |
                     ---------------------     ----------------
                     | Check for 115 V a.c.| NO |Renew heated  |
                     | at terminal 4 of  |----|muff (6).      |
                     | associated terminal|    ----------------
                     | block.            |
                     ---------------------
                               |
                              YES
                               |
                     ---------------------
                     | Renew heated gasket|
                     | (9).              |
                     ---------------------
```

Chart 102

R **ON A/C 006-007,

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(1) Circuit breaker 115 V	-	14-215	H1972	Map ref.C9	24-50-00 R/I	
(2) Forward toilet thermostat	113 BB	124	H1979	Underfloor	30-73-21 R/I	
(3) Left centre toilet thermostat	131 VS	131	H1976	Underfloor	30-73-21 R/I	
(4) Right centre toilet thermostat	132 VS	132	H1973	Underfloor	30-73-21 R/I	
(5) Forward toilet heated muff	113 BB	124	H1981	Underfloor	38-31-12 R/I	
(6) Left centre toilet heated muff	131 VS	131	H1977	Underfloor	38-31-12 R/I	
(7) Right centre toilet heated muff	132 VS	132	H1986	Underfloor	38-31-12 R/I	
(8) Forward toilet heated gasket	124 AB	124	H1980	Servicing compart-ment	38-31-12 R/I	
(9) Left centre toilet heated gasket	191 GB	191	H1978	Servicing compart-ment	38-31-12 R/I	
(10) Right centre toilet heated gasket	192 GB	192	H1975	Servicing compart-ment	38-31-12 R/I	

Component Identification
Table 101

R **ON A/C 001-005,

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	MANUAL REF. WIRING DIAGRAM
(1) Circuit breaker 115 V	-	14-215	H1972	Map ref.B8	24-50-00 R/I	
(2) Forward toilet thermostat	113 BB	124	H1979	Underfloor	30-73-21 R/I	
(3) Left centre toilet thermostat	131 VS	131	H1976	Underfloor	30-73-21 R/I	
(4) Right centre toilet thermostat	132 VS	132	H1973	Underfloor	30-73-21 R/I	
(5) Forward toilet heated muff	113 BB	124	H1981	Underfloor	38-31-12 R/I	
(6) Left centre toilet heated muff	131 VS	131	H1977	Underfloor	38-31-12 R/I	
(7) Right centre toilet heated muff	132 VS	132	H1986	Underfloor	38-31-12 R/I	
(8) Forward toilet heated gasket	124 AB	124	H1980	Servicing compart-ment	38-31-12 R/I	
(9) Left centre toilet heated gasket	191 GB	191	H1978	Servicing compart-ment	38-31-12 R/I	
(10) Right centre toilet heated gasket	192 GB	192	H1975	Servicing compart-ment	38-31-12 R/I	

Component Identification
Table 101

TOILET DRAINS ANTI-ICING - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

This Functional Test checks the integrity of the heating elements only.

Operational and System tests are not considered necessary in this application.

2. Functional Test

A. Equipment and Materials

DESCRIPTION	PART NO.
Suitable testmeter (e.g., Avometer)	-
Torque spanner, 12 to 14 lbf in (0.137 to 0.160 mdaN)	ULTRA-WB808-6UNC
Circuit breaker safety clip	-

B. Prepare

R **ON A/C 006-007,

(1) Trip and fit a safety clip to toilet drain circuit breaker H1972, panel 14-215, map ref.C9.

**ON A/C 001-005,

(1) Trip and fit a safety clip to toilet drain circuit breaker H1972, panel 14-215, map ref.B8.

(2) Gain access to one of the toilet drains as follows:

(a) Remove access panel 123 BB for the forward toilet.

(b) Remove the appropriate baggage compartment sidewall panel for the centre toilets.

(3) Referring to Table 501, disconnect and pull back

the appropriate cable from terminal 2 of the associated terminal block, which is located near the toilet drain heater muff.

TOILET DRAIN	LOCATION (ZONE)	TERMINAL BLOCK IDENT.	CABLE IDENT.
Forward	124	H1987	H2100A
Left centre	131	H1988	H2097A
Right centre	132	H1989	H2094A

Wiring Location
Table 501

C. Test

(1) Using suitable adapters, connect a testmeter, set to an a.c. current range from 0 to at least 1A, between terminals 1 and 2 of the associated terminal block.

(2) Make available electrical ground power as detailed in 24-41-00.

(3) Reset circuit breaker H1972 and ensure that the testmeter indicates a nominal 0.5A.

(4) Trip and fit a safety clip to circuit breaker H1972.

(5) Disconnect and remove the testmeter, then reconnect the electrical cable to the terminal block, ensuring that the connection is made in accordance with the cable identification and the applicable wiring diagram; torque-tighten the terminal nut to between 12 and 14 lbf in (0.137 and 0.160 mdaN).

(6) Refit the access panel or baggage compartment sidewall panel, as applicable.

(7) Repeat operations B.(2) and (3), and C.(1) to (6) inclusive, for the remaining two toilet drain heaters.

D. Conclusion

(1) Reset circuit breaker H1972.

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(2) Switch off and disconnect electrical ground power as detailed in 24-41-00.

THERMOSTAT - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Each thermostat is attached to a stub pipe near the associated toilet (closet) drain. Access to the forward toilet thermostat is gained by removal of an external access panel and to the centre toilet thermostats by removal of baggage compartment sidewall panels.

2. Thermostat

A. Equipment and Materials

DESCRIPTION	PART NO.
Circuit breaker safety clip	-
Torque spanner, 12 to 14 lbf in (0.137 to 0.160 mdaN)	ULTRA-WB808-6UNC

B. Prepare

R **ON A/C 006-007,

(1) Trip and fit a safety clip to toilet drain circuit breaker H1972, panel 14-215, map ref.C9.

**ON A/C 001-005,

(1) Trip and fit a safety clip to toilet drain circuit breaker H1972, panel 14-215, map ref.B8.

(2) Gain access to the stub pipe as follows:

(a) Remove access panel 123 BB for the forward toilet.

(b) Remove baggage compartment sidewall panel 131 VS for the left centre toilet.

(c) Remove baggage compartment sidewall panel 132 VS for the right centre toilet.

C. Remove

(1) Partially unclip the insulating muff to facilitate access to the thermostat.

(2) Disconnect the thermostat electrical cables from the associated terminal block.

(3) Remove the nut and bolt securing the thermostat to the pipe, then disengage the thermostat complete with the electrical cables.

D. Install

(1) Comply with the electrical safety precautions.

(2) Position the thermostat on the pipe, ensuring correct alignment with the insulating muff, then refit and tighten the nut and bolt.

(3) Fasten the insulating muff.

(4) Connect the thermostat electrical cables to the associated terminal block, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram; torque-tighten the terminal nuts to between 12 and 14 lbf in (0.137 and 0.160 mdaN).

E. Conclusion

(1) Remove the safety clip and reset the circuit breaker tripped during preparation for test.

(2) Perform a Functional Test of the thermostat as detailed in Adjustment/Test.

(3) Remove all tools and equipment, then refit the access panel or sidewall panel, as applicable.

THERMOSTAT - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

The following Functional Test proves that the thermostats are operating, but not necessarily within the pre-set operating range. Operational and System Tests are considered unnecessary in this application.

Each thermostat is attached to a lower stub pipe near the associated toilet (closet) drain. Access to the forward toilet thermostat is gained by removal of an external access panel and to the centre toilet thermostats by removal of baggage compartment sidewall panels.

2. Functional Test

A. Equipment and Materials

R

DESCRIPTION	PART NO.
Testmeter (e.g., Avometer) and suitable adapters	-
Cooling agent, e.g., solidified carbon dioxide (CO2), water ice, etc.	-
Plastic bag for containing cooling agent	-
Protective gloves (not required for water ice)	-
Warm, dry air supply or suitable alternative for warming the thermostat	-

R
R
R

B. Prepare

(1) Ensure that the associated toilet drain stub pipe has been drained of water waste.

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R (2) Gain access to the stub pipe as follows:

(a) Remove access panel 123 BB for the forward toilet.

(b) Remove baggage compartment sidewall panel 131 VS for the left centre toilet.

(c) Remove baggage compartment sidewall panel 132 VS for the right centre toilet.

(3) Make available electrical ground power as detailed in 24-41-00.

C. Test

(1) Identify the appropriate terminal block located near the stub pipe; refer to Table 501 for identification.

R

R

TOILET DRAIN	LOCATION (ZONE)	TERMINAL BLOCK IDENT.
Forward	124	H1987
Left centre	131	H1988
Right centre	132	H1989

R

Terminal Block Identification
Table 501

NOTE: The following four operations may be carried out in the order shown or in the order (5), (2), (3) and (4), whichever is the more suitable for the temperature conditions obtaining.

The instructions for cooling or warming the thermostat may be disregarded if the body of the thermostat is already subject to the required test temperature.

(2) Using the protective gloves, as required, place some cooling agent in the plastic bag.

WARNING: AVOID DIRECT CONTACT WITH SOLIDIFIED CARBON DIOXIDE, OTHERWISE SKIN BURNS WILL RESULT.

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(3) Open the associated drain cap and place the plastic bag inside the drain to reduce the temperature below the cut-in value of 40(±5) deg F (4.4(±2.75) deg C) then, using the testmeter set to a nominal range of at least 0 to 200 V a.c., ensure that a 115 V a.c. supply is available between a suitable earth point and terminal 2 of the associated terminal block.

(4) Remove the plastic bag.

(5) Direct the warm, dry air supply on to the thermostat to increase the temperature above the cut-out value of 55(±5) deg F (12.8(±2.75) deg C) then, using the testmeter set to a nominal range of at least 0 to 200 V a.c., ensure that no a.c. supply is present between a suitable earth point and terminal 2 of the associated terminal block.

(6) Repeat operations B.(1) to (3) and C.(1) to (5) for the remaining two toilet drain thermostats.

D. Conclusion

(1) Remove all equipment and materials, then refit the access panel or baggage compartment sidewall panel, as applicable.

(2) Switch off and disconnect electrical ground power as detailed in 24-41-00.

DETECTION - DESCRIPTION AND OPERATION

1. General

Two ice detection systems, designated 'left' and 'right', are provided to give in-flight warning of icing conditions. A detector head associated with each system projects into the airstream and, in icing conditions, collects ice accretions. Once the accretions have formed, a cycle of operations is initiated which includes the introduction of ice warning indications and de-icing of the detector head.

Air pressures sensed by the detector head and an associated static vent are applied to a capsule switch in a relay unit. Under icing conditions or during ground testing the relay unit switches the supply for the detector head heating element and energizes an indication control relay which, in turn, causes ice warning indications to be introduced.

An associated weight switch relay (Ref. Chap.32) prevents overheating of the detector head de-icing element during ground operation, i.e., testing, of the system.

2. Detector Head (Ref. Fig. 001 and 002)

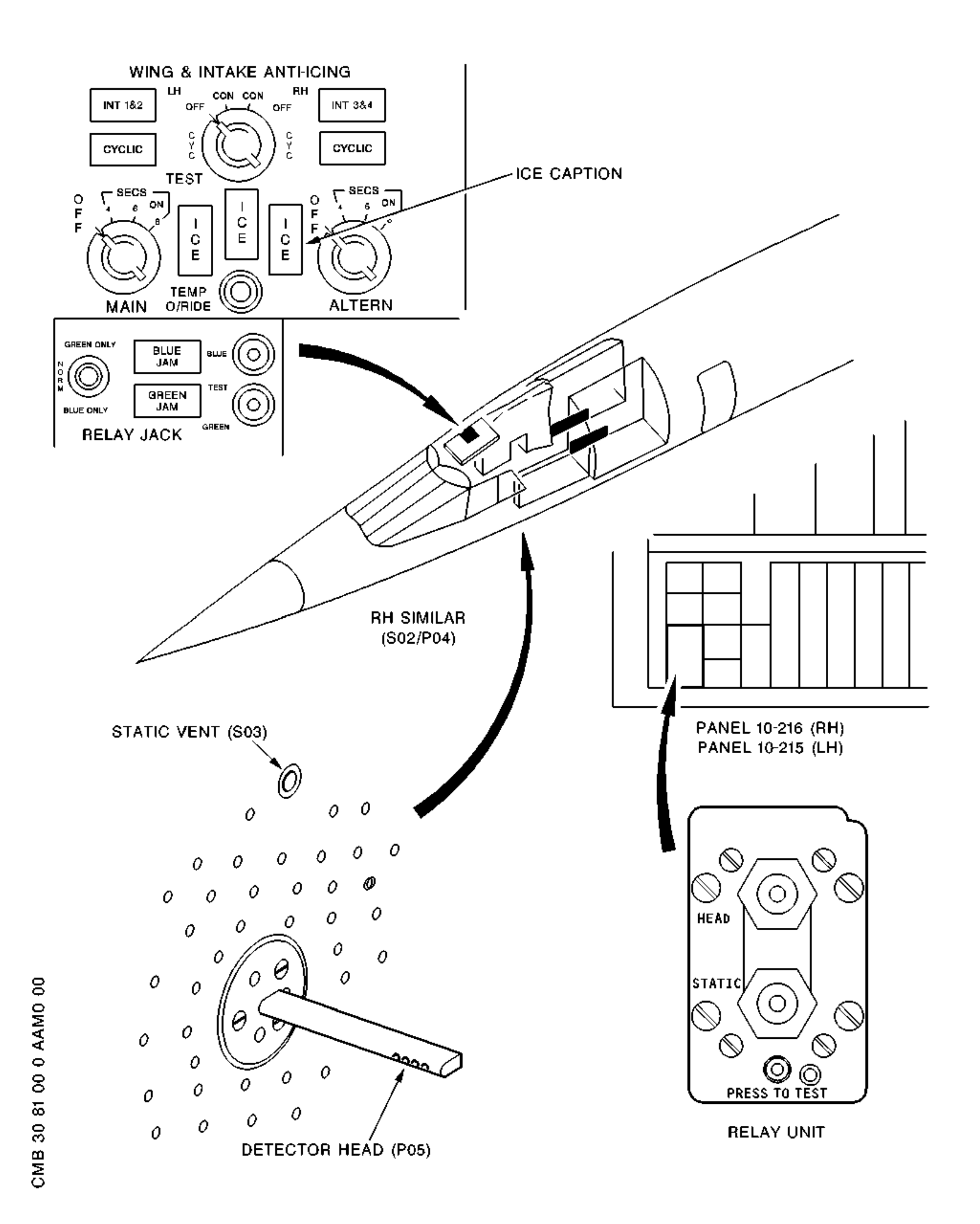
Two detector heads are mounted on the fuselage below the flight compartment side windows, one on the left and one on the right.

Each detector head comprises an aerofoil-shaped probe, closed at its extremity, into which is fitted an electrical heating element. A tubular baffle fitted in the forward-facing section of the probe has circumferential grooves which align with four small holes in the leading edge of the probe. Two additional holes are provided in the aft face of the probe. The pressure sensed in the probe is fed to a low pressure outlet for application to the relay unit.

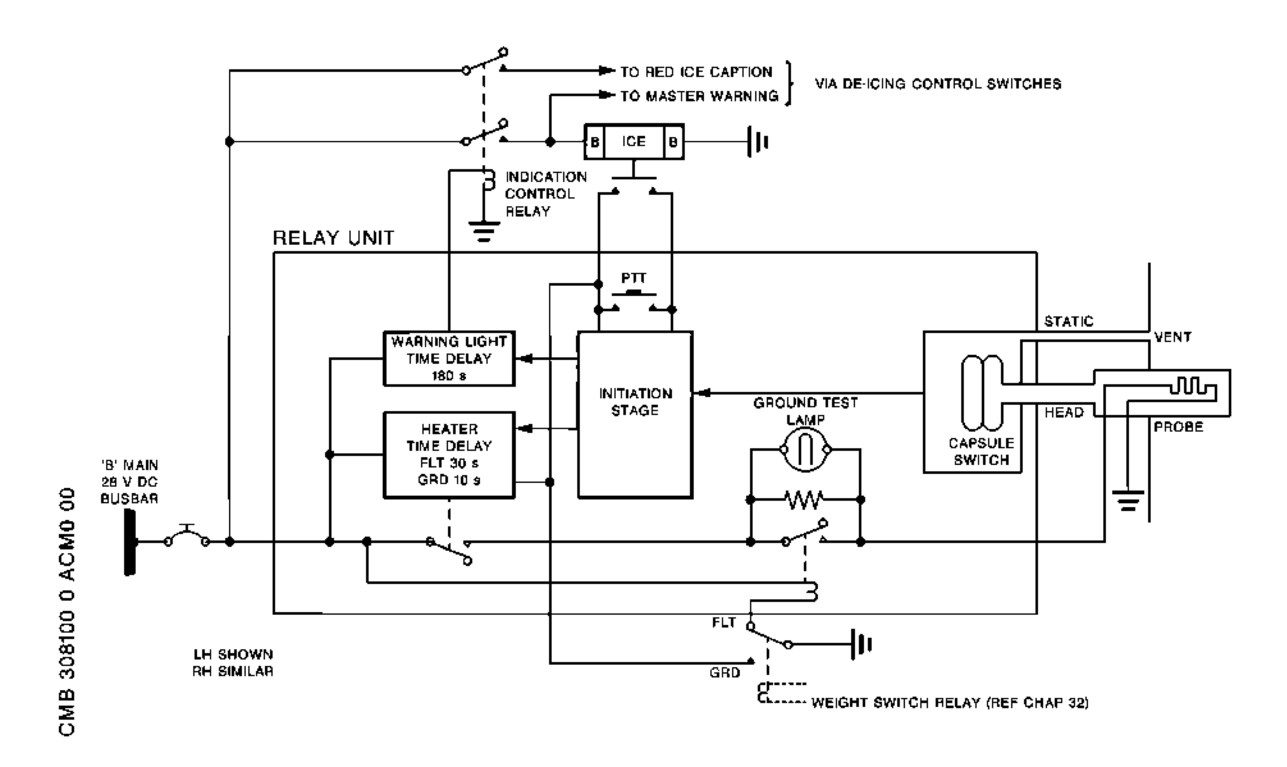
3. Static Vent (Ref. Fig. 001)

Two static vents, one for each system, are mounted on the fuselage slightly above the detector heads.

Each vent senses local static pressure in the vicinity of a detector head, to provide a reference for the pressure sensed by the detector head.



Detection Systems
Figure 001



Detection System - Simplified Schematic
Figure 002

4. Relay Unit (Ref. Fig. 001 and 002)

Two relay units, one for the left system and one for the right, are mounted in the flight compartment racking on shelves 10-215 and 10-216 respectively.

The functions of the relay units are as follows:

(1) To respond to the changes in pressure from the detector head when icing conditions are present.

(2) To introduce de-icing of the detector head for a defined period after operation of a capsule switch.

(3) To provide an output to the warning system for a defined period.

(4) To provide a press-to-test facility.

The components are mounted on a chassis and front panel assembly and housed in an Elfin case. On the front panel, two manometric connectors, identified HEAD and STATIC respectively, are provided for connection to the detector head and the static vent via pipelines.

Internally the pressure from the HEAD connector is applied to the interior of a capsule, and the pressure from the STATIC connector is applied to the exterior of the capsule. Also mounted on the front panel is a ground test facility consisting of a PRESS TO TEST push-switch and a lamp.

5. Indication Control Relay (Ref. Fig. 002)

Two indication control relays, one for the left system and one for the right, are mounted in ice relay boxes 13-123 and 16-123 respectively, located in the underfloor racking. Each relay controls a blue ICE caption and, under certain conditions, a red ICE caption and master and audio warnings. Energization of a relay occurs whenever the associated relay unit provides an output to the warning system.

6. Operation (Ref. Fig. 002)

A. Control and Indication

Three captions, each engraved ICE, are mounted on flight compartment roof panel 4-211. The outer two captions are blue and the centre caption is red. The blue captions have a press-to-test facility which parallels the function of the switch on the relay unit.

The blue and red ICE captions can be dimmed or tested by an associated switch (Ref. 33-14-00).

In flight, when icing conditions prevail, each blue ICE caption is illuminated by its associated left or right system. Under these conditions it is required that the wing and intake de-icing system (Ref. 30-11-00) and the engine anti-icing systems (Ref. 75-11-00) are switched on. Therefore if any one of these systems is in the 'off' condition coincident with illumination of either or both blue ICE captions, the centre red ICE caption will be
R illuminated. In addition, for RH detection only, the master and
R audio warnings (red ICE caption and single stroke gong) will be
R introduced. Whereas, for LH detection only, master warnings will
R only be introduced if the Main and Alternate wing and intake
R anti-icing selector switches are in the "OFF" position.

B. Functional Description

Power supplies for both systems are obtained direct from 28 V d.c. busbars. As a result, the systems are operative whenever electrical power is available on the aircraft.

In flight, in ice-free conditions, the airstream maintains the pressure sensed by the detector head above the static pressure sensed by the static vent. As a result, the capsule switch is held in a ready condition.

With the onset of icing conditions, the holes in the leading edge of the head are sealed by ice accretions, and the pressure sensed by the head is consequently reduced below the static pressure. This reduction in pressure causes contacts of the capsule switch to operate, and a warning cycle of the system is initiated as follows.

First, the circuits in the relay unit energize the indication control relay and an integral relay. These relays respectively illuminate the blue ICE caption, to provide warning of the icing condition, and commence de-icing of the detector head by applying power to the heating element. Full power is applied to the heating element, and this is achieved by a second relay integral with the relay unit, which remains energized in flight due to the de-energization of an associated weight switch relay. Energization of the indication control relay will also illuminate the red ICE caption and introduce the master and audio warnings, if any of the associated de-icing or anti-icing systems remain
R switched off (Ref. para. 6.A.).

When the detector head has been de-iced sufficiently to allow partial restoration of the positive head pressure, the contacts of the capsule switch operate again, and introduce two time delays. One maintains the warning indications for a further 3 min, and the other maintains the detector head de-icing for a further 30 s. Thus the warning indications are provided for 3 min after the aircraft leaves the icing zone, enabling most of the ice accretions to be removed before the de-icing and anti-icing systems are switched off, and the detector head is fully de-iced in preparation for a further warning cycle.

If a subsequent icing condition occurs before the 3 min period is completed, a new cycle is commenced, and the warning indications will be given for a further 3 min. If no more 'icing signals' are received, the system reverts to a ready condition.

In a test cycle, with the aircraft on the ground, power is applied to the detector head heating element to check the heater time cycle and continuity. To provide the necessary indication and to guard against overheating of the element, an associated weight switch relay is energized on the ground and -

(1) the lamp on the relay unit is introduced into the heater circuit,

(2) the heater supply voltage is reduced, and

(3) the heater time cycle is reduced.

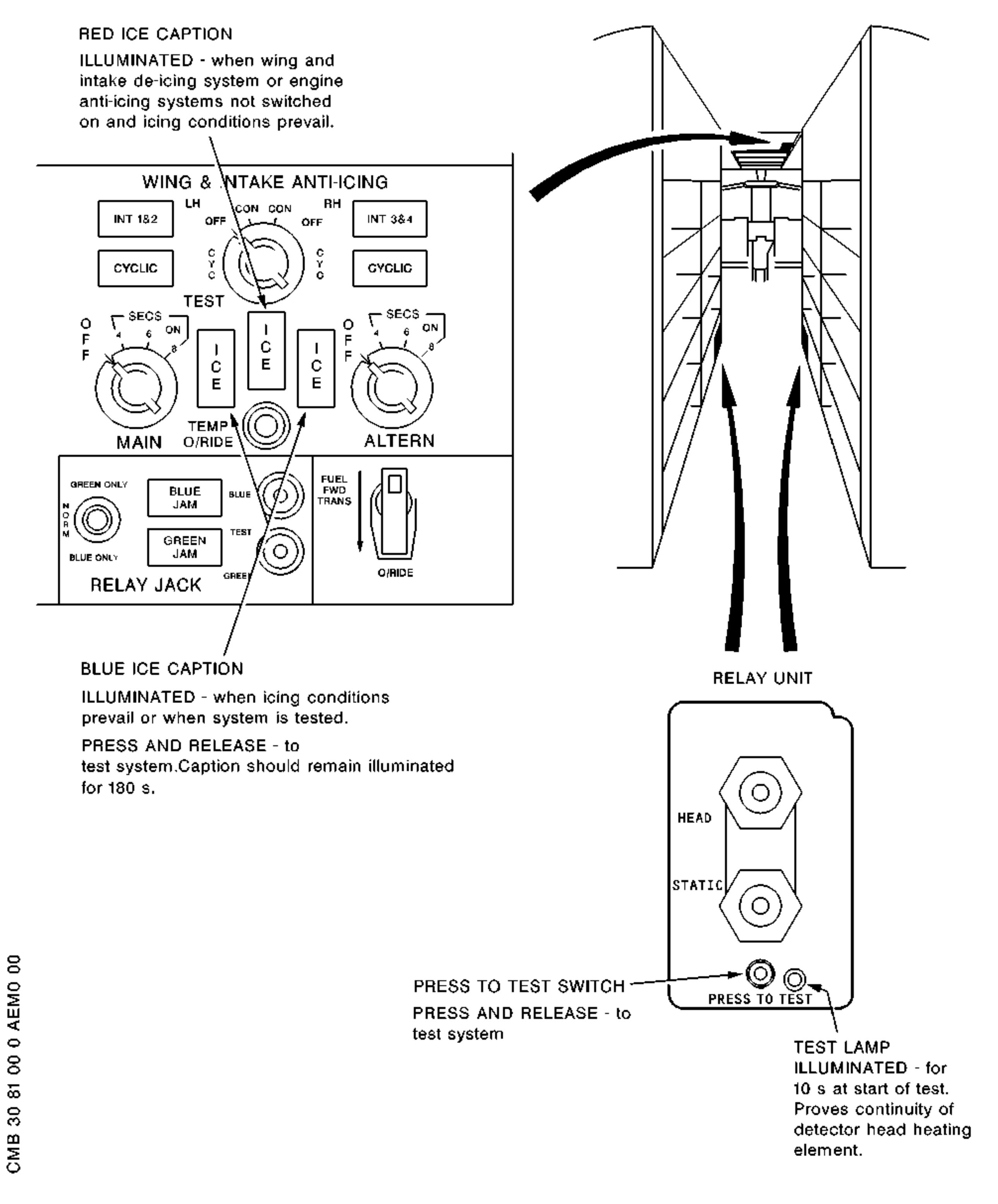
To initiate the test cycle, the blue ICE caption or the press-to-test switch on the relay unit must be pressed for at least 2 s and then released. As the caption or switch is released, the circuits in the relay unit energize the indication control relay and an integral relay, and also introduce two time delays. As a result, ice warning indications as for an in-flight warning cycle are provided for 3 min, and power is applied to the detector head heating element for 10 s. As the lamp on the relay unit is in circuit with the heating element, due to the operation of the weight switch relay, it will be illuminated for the 10 s of heater operation.

C. Electrical Power Supplies

The left and right ice detection systems are supplied in the air or on the ground from the 'A' main and 'B' main 28 V d.c. busbars respectively.

7. System Management (Ref. Fig. 003)

With electrical power available, the ice detection systems can be checked using the controls and indicators as directed on the illustration.



CMB 30 81 00 0 AEMO 00

System Management
Figure 003

DETECTION - TROUBLE SHOOTING

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Faults are dealt with on a probability basis and identified as a result of testing.

The defect can be isolated with the aid of trouble shooting procedures (Ref. para.3.), and traced through IF OK and IF NOT OK paths to the appropriate charts or other specified rectification action as may be necessary. If a defect occurs, perform the appropriate rectification action, then repeat the operation at which the defect was encountered to ensure that the operation is OK.

Bracketed numbers in the procedures and charts indicate items on the component identification table (Ref. Table 101). The table provides information, including component location, required for rectification. Component location also indicates the possible necessity of repositioning certain items of ground service equipment. Each chart also specifies the ground equipment required for that particular task.

All procedures dealing with trouble shooting are based on the assumption that electrical wiring is serviceable, all associated circuit breakers are set and electrical power is available, unless otherwise stated. If the fault is not rectified, check the wiring in accordance with the Wiring Diagram Manual (Ref. Table 101).

The two ice detection systems are essentially similar, therefore the procedures and charts are applicable to both. Where two identical components are involved, i.e., one in each system, both references to the associated components listed in Table 101 are given, e.g., 'Renew Relay Unit (3) or (4)'. These references, and others applicable to associated components, are presented in the sequence LH, RH.

2. Preparation

A. Ensure that the system circuit breakers are set (Ref. Table 101).

B. Isolate the associated wing and intake anti-icing and engine anti-icing systems by tripping and fitting safety clips to the following circuit breakers.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
ENG 2 ANTI-ICE CONT	15-215	2H1311	B15
ENG 3 ANTI-ICE CONT		3H1311	B16
WING & INT NORM CONT & SUP		1H1836	D10
ENG 1 ANTI-ICE CONT	15-216	1H1311	C10
ENG 4 ANTI-ICE CONT		4H1311	C11
WING & INT ALTN CONT & SUP		2H1836	E14

C. Ensure that the weight of the aircraft is on the landing gear, i.e., weight switches operated.

D. Ensure that all services liable to be adversely affected by the tripping of the two weight switch circuit breakers are effectively isolated (Ref. 7-11-00), except the ice detection systems.

E. Remove the protective cover from shelf 10-215 (10-216) of the flight compartment racking to gain access to the relay unit.

F. Remove the protective cover from the left (right) probe.

G. Make available electrical ground power as detailed in 24-41-00, Servicing.

H. On panel 4-211, set the wing and intake anti-icing MAIN selector
R switch to the '4 SECS' position (ALTERN selector in 'OFF'
R position) and the four engine anti-icing control switches to the
"ON" position.

3. Trouble Shooting

A. Prepare to trouble shoot (Ref. para.2.). On panel 4-211, set the LIGHTS switch to the "TEST" position. Check that among others, the three system ICE captions are fully illuminated. IF -

- OK → B.
- NOT OK → Ice caption fails filament test - Renew filament(s).

B. Cycle the left (right) ice detection system by pressing the left (right) blue ice caption for at least 2 s. As the caption is released, check that -
(a) the test lamp on the associated relay unit is illuminated for 10 (±5) s,
(b) the pressed ice caption is illuminated for 3 min (±36 s),
(c) the appropriate probe warms up and cools down, and
(d) the system red ice caption and the master warning red ice caption remain extinguished. IF -

- OK ↓
- NOT OK →
  1. System does not cycle, i.e., test lamp and blue ice caption not illuminated - Chart 101.
  2. Blue ice caption illuminated, but test lamp not illuminated - Chart 102.
  3. Test lamp illuminated, but blue ice caption not illuminated - Chart 103.
  4. Test times not within quoted limits - renew Relay Unit (3) or (4).
  5. System red ice caption and/or master warning red ice caption illuminated - Chart 104.

OK

C. Cycle the system by pressing the PRESS TO TEST push-switch on the Relay Unit (3) or (4) for at least 2 s. As the test cycle commences, set the wing and intake anti-icing MAIN selector switch to the "OFF" position. Check that the audio warning gong sounds at least once and, in addition to the blue ice caption, the system red ice caption and the master warning red ice caption are illuminated. IF -

NOTE: The tests in paragraphs D. and E. must be carried out within the test cycle.

NOT OK

1. System red ice caption fails to become illuminated with MAIN and ALTERN selector switches at OFF position - Chart 105.
2. No gong or master warning red ice caption illuminated with MAIN and ALTERN selector switches at OFF position - Chart 106.
3. System does not cycle - renew Relay Unit (3) or (4).

OK

D. Set the ALTERN selector switch to the "4 SECS" position and check that the system red ice caption and the master warning red ice caption are extinguished. IF -

NOT OK

System red ice caption or master warning red ice caption remain illuminated with ALTERN selector switch at the 4 SECS position - renew Switch (13).

OK

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OK

E. Set each engine anti-icing control switch to the "OFF" and "ON" positions in turn. Check each time that the system red ice caption is first illuminated and then extinguished and, for the RH system only, check each time that the master warning red ice caption is first illuminated and then extinguished. IF -

NOTE: The audio warning gong will sound each time the master warning caption is illuminated.

NOT OK — System red ice caption or master warning red ice caption fails to become illuminated with engine anti-icing control switch at OFF position - renew whichever switch produced the fault, i.e., (14), (15), (16) or (17).

OK

F. Trip CB (1) or (2). Use the recommended probe adapter and static vent adapter and simultaneously apply a negative pressure, equivalent to a pressure altitude of 30,000 ft (11,700 m) to the Probe (8) or (9) and Static Vent (above the probe). Check that the pressure altitude does not fall below 23,000 ft (8,400 m) over a period of 4 min. IF -

NOT OK — System fails manometric leak test - rectify as necessary.

OK

OK

G. CAUTION: CB (1) OR (2) MUST BE TRIPPED IMMEDIATELY THE FOLLOWING TEST INDICATIONS HAVE BEEN CHECKED.

Trip weight switch CB G292, panel 1-213, map ref. K17 (G294, panel 3-213, map ref. C9) and reset CB (1) or (2). Use the recommended probe adapter and apply a pressure of 2.55(±0.5) in (65(±15 mm) water gauge to the probe for 5 s only. Check that the test lamp on the relay unit remains extinguished and the left (right) blue ice caption is illuminated. Trip CB (1) or (2) immediately. Remove the probe adapter and, using caution, check that the probe has been heated. IF -

NOT OK

1. System not cycling under flight conditions - renew Relay Unit (3) or (4).
2. Test lamp on relay unit illuminated under flight conditions - suspect weight switch relay. For further trouble shooting refer to Chapter 32.

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SYSTEM DOES NOT CYCLE, I.E., TEST LAMP AND BLUE ICE CAPTION NOT ILLUMINATED.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

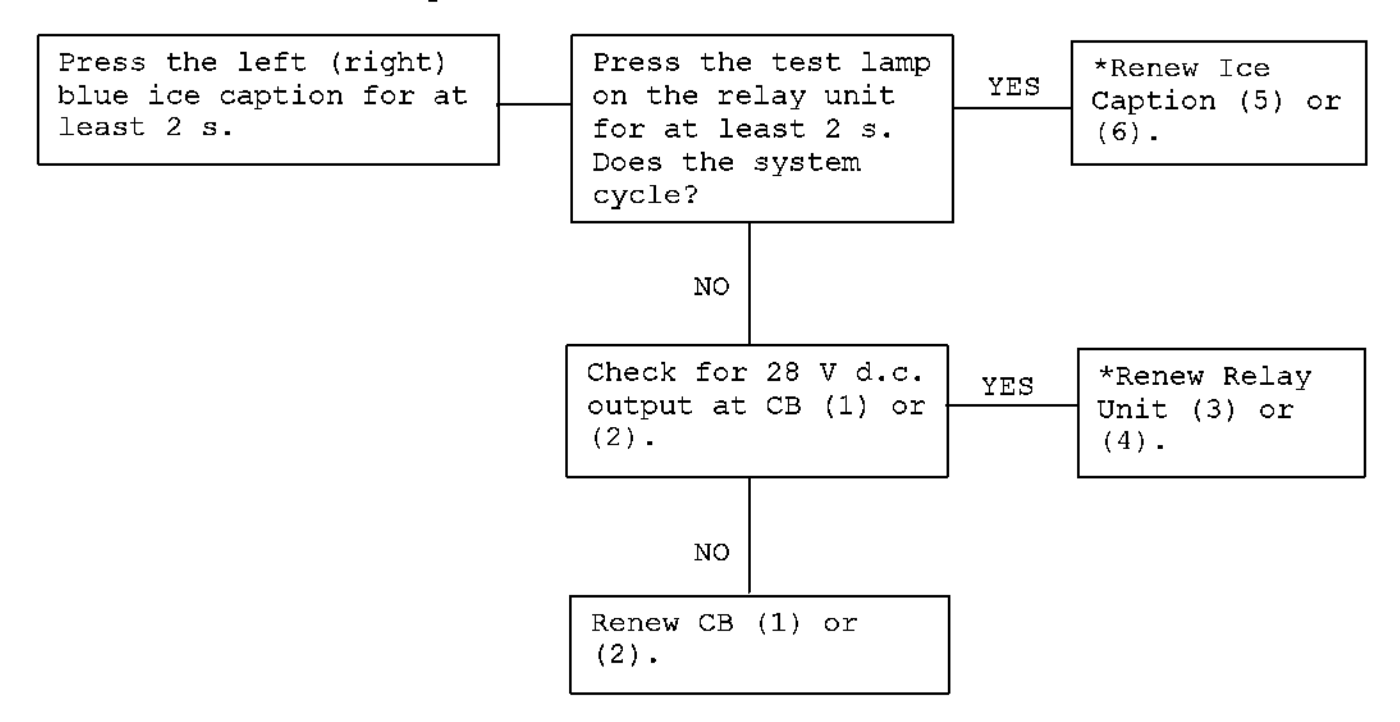


Chart 101

BLUE ICE CAPTION ILLUMINATED, BUT TEST LAMP NOT ILLUMINATED.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

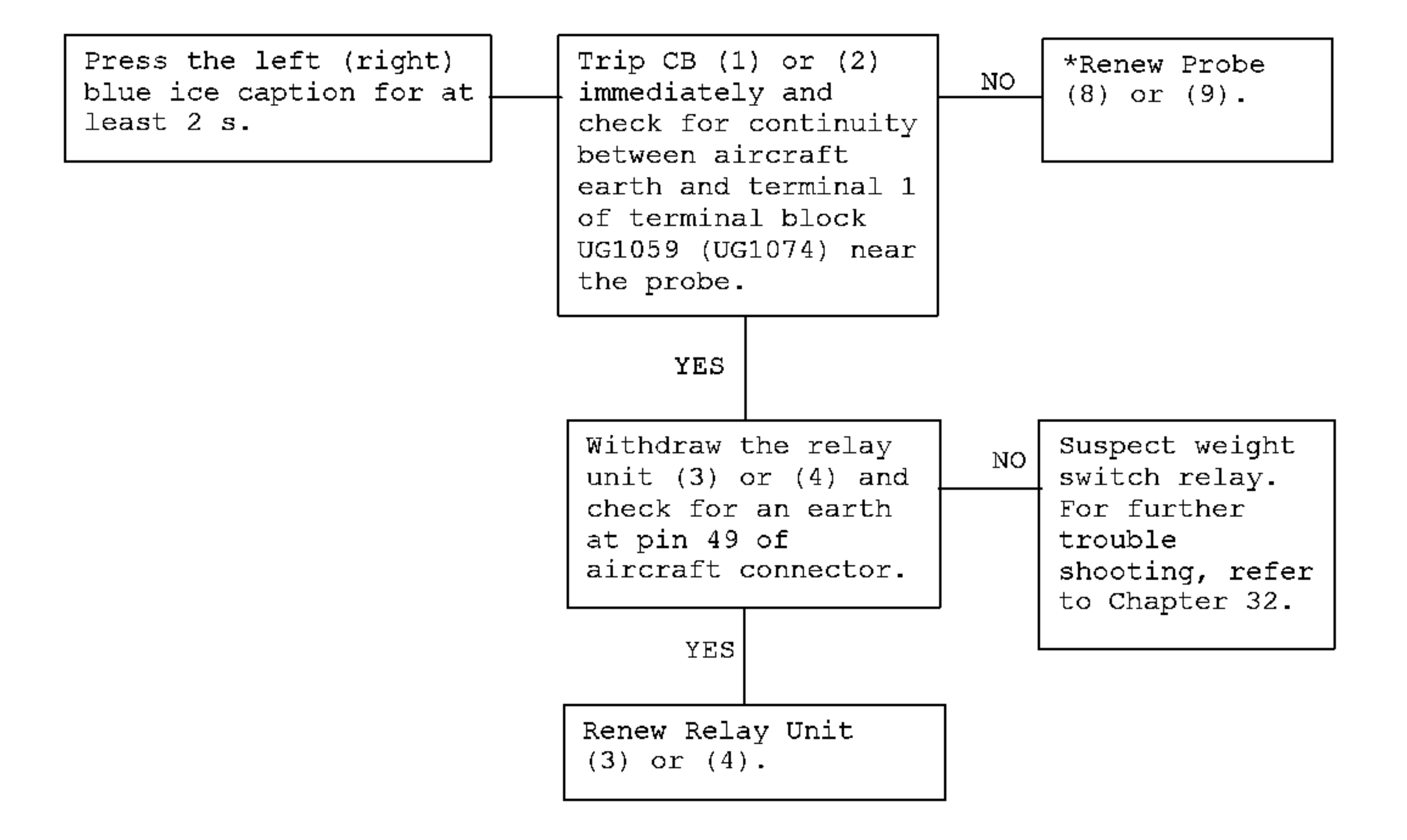


Chart 102

TEST LAMP ILLUMINATED, BUT BLUE ICE CAPTION NOT ILLUMINATED

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

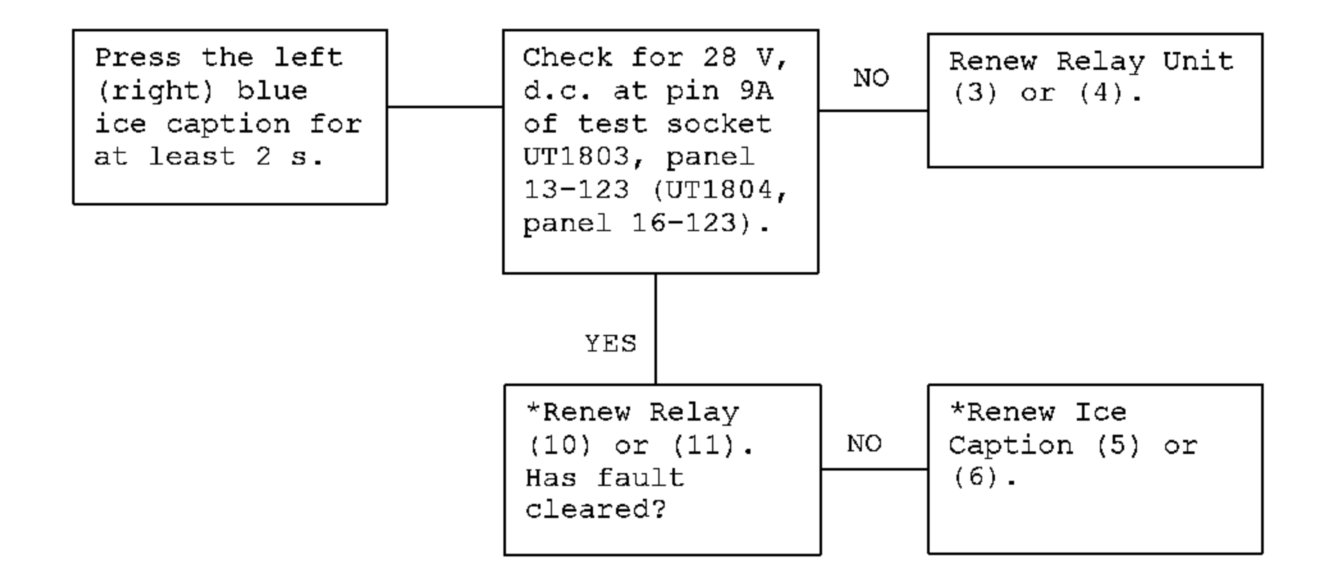


Chart 103

SYSTEM RED ICE CAPTION AND/OR MASTER WARNING RED ICE CAPTION ILLUMINATED.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

Press the left (right) blue ice caption for at least 2 s.

Set the wing and intake anti-icing ALTERN selector switch to the "4 SECS" position. Has fault cleared?

YES: *Renew Switch (12).

NO: First removing the cables, check that there is an open circuit between terminals 5 and 6 (2 and 3) of the engine anti-icing control switches.

NO: *Renew Switch (14), (15), (16) or (17).

R NOTE: Reference to engine anti-icing control switches is not applicable
R when left blue ice caption is selected and master warnings are
R introduced. (Ref. Description and Operation para. 6.A.).

Chart 104

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SYSTEM RED ICE CAPTION FAILS TO BECOME ILLUMINATED WITH MAIN AND ALTERN SELECTOR SWITCHES AT 'OFF' POSITION.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

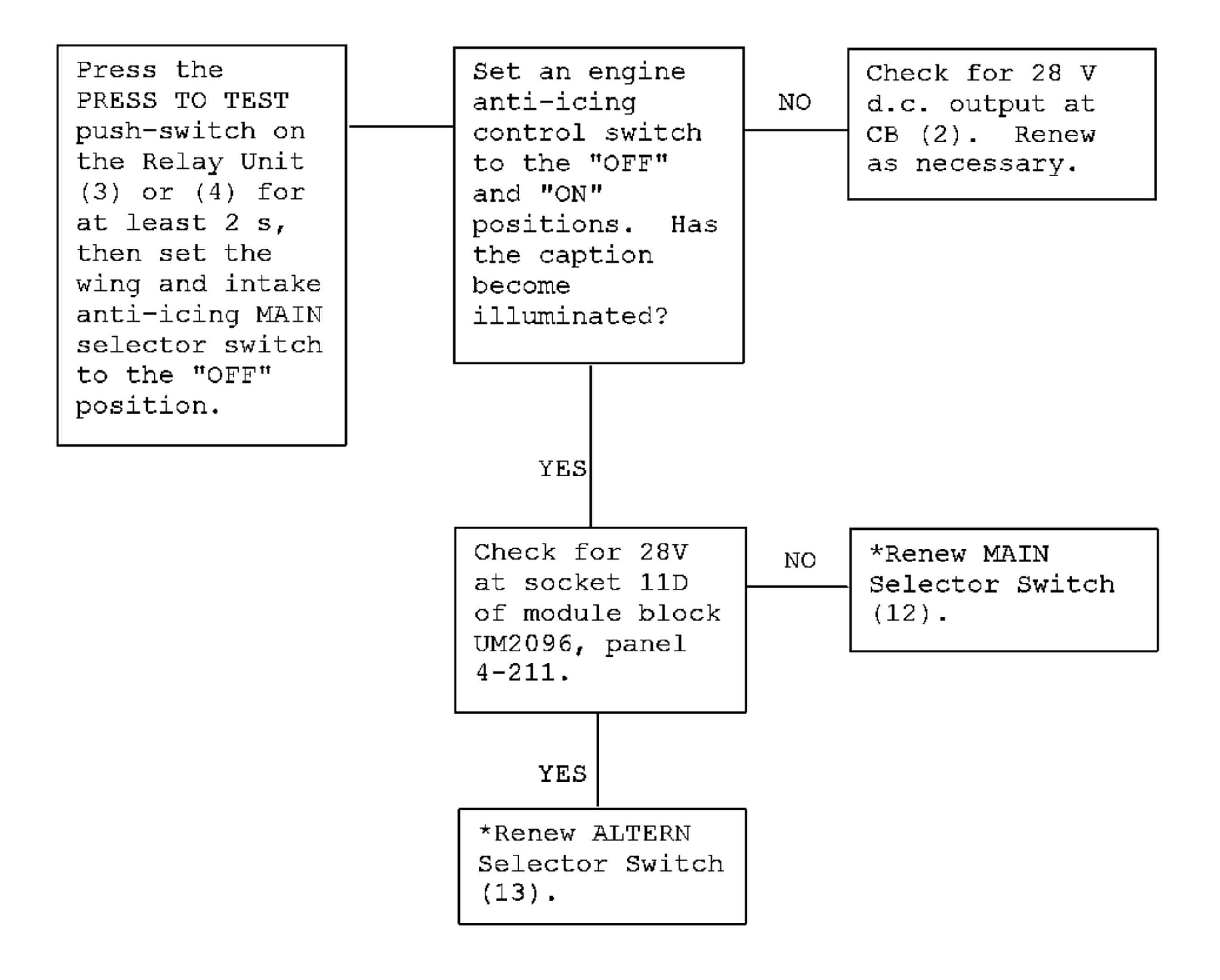


Chart 105

NO GONG OR MASTER WARNING RED ICE CAPTION ILLUMINATED WITH MAIN AND ALTERN SELECTOR SWITCHES AT 'OFF' POSITION.

GROUND EQUIPMENT REQUIRED	
DESCRIPTION	PART NO.
GROUND POWER SUPPLY	-
MULTIMETER (E.G., AVOMETER)	-

NOTE: Before renewal of components (*), check the associated wiring for continuity.

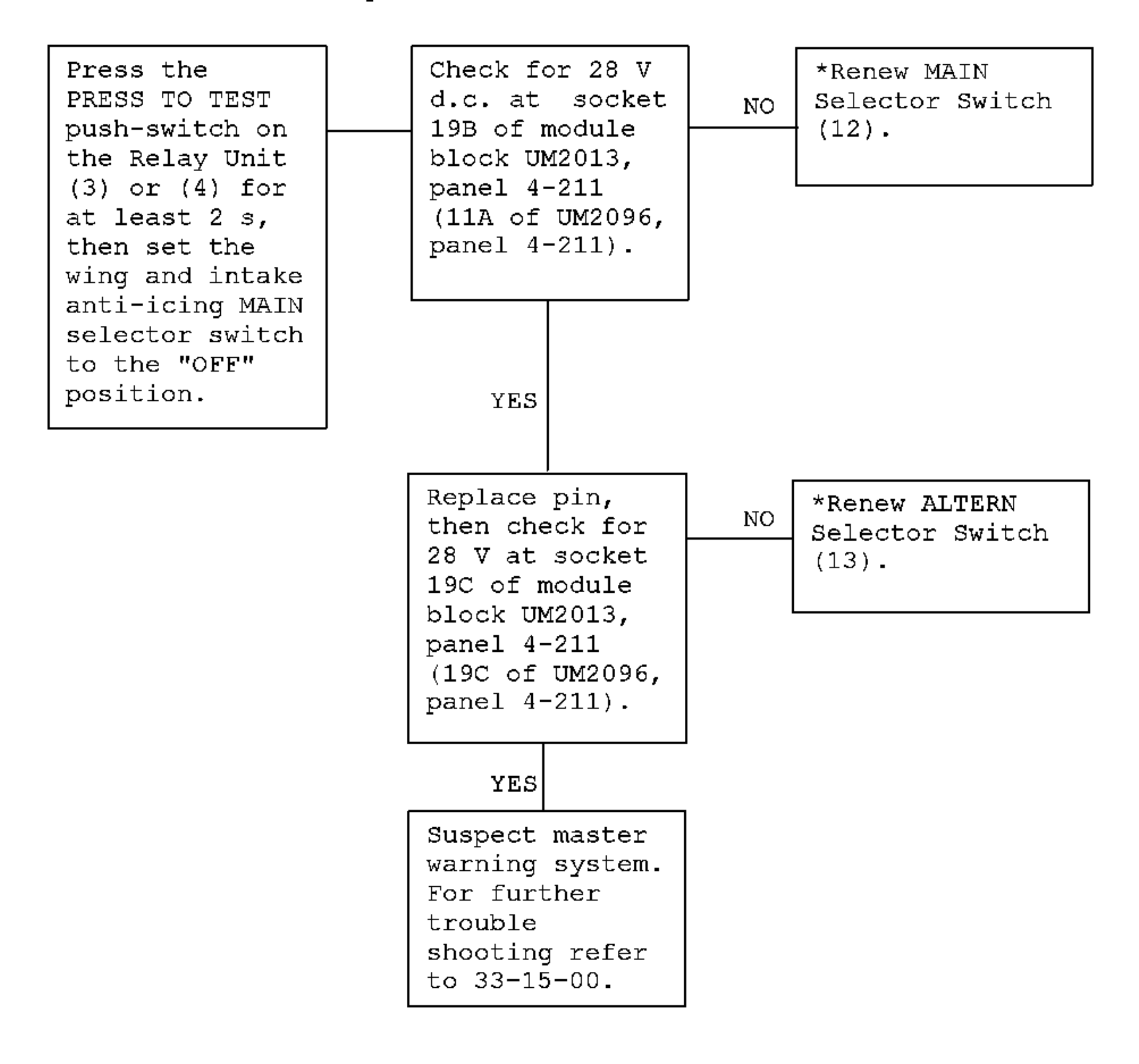


Chart 106

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(1) Circuit breaker 28 V	-	15-215	1H101	Map ref.A12	24-50-00 R/I	30-81-01
(2) Circuit breaker 28 V	-	15-216	2H101	Map ref.B16	24-50-00 R/I	30-81-01
(3) LH relay unit	-	10-215	1H102	Flt. compt. racking	30-81-11 R/I	30-81-01
(4) RH relay unit	-	10-216	2H102	Flt. compt. racking	30-81-11 R/I	30-81-01
(5) LH ice caption	-	4-211	1H105	Flt. compt. roof panel	30-00-00 R.I	30-81-01
(6) RH ice caption	-	4-211	2H105	Flt. compt. roof panel	30-00-00	30-81-01
(7) Centre ice caption	-	4-211	H106	Flt. compt. roof panel	30-00-00 R/I	30-81-01
(8) LH probe	121DB	121	P05/ 1H104	Fuselage side, forward	30-81-12 R/I	30-81-01
(9) RH Probe	121DB	122	P04/ 2H104	Fuselage side, forward	30-81-12 R/I	30-81-01
(10) LH control relay	-	13-123	1H103	LH ice relay box	30-00-00 R/I	30-81-01
(11) RH control relay	-	16-123	2H103	RH ice relay box	30-00-00 R/I	30-81-01
(12) MAIN selector switch	-	4-211	H1837	Flt. compt. roof panel	30-00-00 R/I	30-11-01
(13) ALTERN selector switch	-	4-211	H1838	Flt. compt. roof panel	30-00-00 R/I	30-11-01

Component Identification
Table 1 (continued)

ITEM NO. AND DESCRIPTION	ACCESS PANEL	PANEL/ ZONE	EQUIP. IDENT.	POSITION	MANUAL REF. MAINT. TOPIC	WIRING DIAGRAM
(14) Engine anti-icing control switch	-	4-211	1H1312	Flt. compt. roof panel	30-00-00 R/I	75-12-01
(15) Engine anti-icing control switch	-	4-211	2H1312	Flt. compt. roof panel	30-00-00 R/I	75-12-01
(16) Engine anti-icing control switch	-	4-211	3H1312	Flt. compt. roof panel	30-00-00 R/I	75-12-01
(17) Engine anti-icing control switch	-	4-211	4H1312	Flt. compt. roof panel	30-00-00 R/I	75-12-01

Component Identification
Table 1 (concluded)

DETECTION - ADJUSTMENT/TEST

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

This topic is in four self-contained parts - an Operational Test, a Functional Test, a Manometric Pipelines Purging procedure and a Manometric Leak Test. A System Test is considered unnecessary in this application.

Throughout the procedures, equipment identifications are provided unbracketed for the left system and bracketed for the right system.

2. Operational Test

A. Prepare

(1) Ensure that the weight of the aircraft is on the landing gear, i.e., weight switches operated.

(2) Remove the protective cover from the appropriate left or right ice detector head.

(3) Place a notice near the detector head, warning of the high temperatures the heater can attain.

(4) Make available electrical ground power as detailed in 24-41-00, Servicing.

(5) On roof panel 4-211 ensure that the following switches are set to the OFF position:

(a) The WING & INTAKE ANTI-ICING system MAIN and ALTERN selector switches.

(b) All four ENGINE ANTI-ICING switches.

B. Test

(1) On panel 4-211, press the left (right) blue ICE caption for at least 2 s, as the caption is released, check that:

(a) The audio warning gong sounds at least once.

(b) The master warning red ICE caption is illuminated.

(c) The left (right) blue ICE caption and the red ICE caption on panel 4-211 are illuminated.

NOTE: All captions will remain illuminated and the warning gong will sound, at approximately 10 s intervals, for approximately 3 min. However, the master and audio warnings may be cancelled by pressing the master warning red ICE caption.

C. Conclusion

(1) Switch off and disconnect electrical ground power as detailed in 24-41-00, Servicing.

(2) When the detector head has cooled sufficiently, refit the protective cover.

(3) Remove the warning notice from the vicinity of the detector head.

3. Functional Test

A. Equipment and Materials

DESCRIPTION	PART NO.
Ice detector probe adapter	E925040000
Stopwatch or suitable watch	-
Water manometer, 0 to 5 in or 0 to 100 mm	-
Bellows unit	-
Circuit breaker safety clips	-

NOTE: Under the heading 'Test system in Flight Configuration' (Ref. para.D.), each system is activated by applying a negative pressure to the associated detector head. If necessary, each system can be activated alternatively by applying a positive pressure, to the same value, to the associated static vent, using a static vent adapter, Part No. D935041000, instead of a probe adapter.

B. Prepare

(1) Ensure that the weight of the aircraft is on the landing gear, i.e., weight switches operated.

(2) Remove the protective cover from the appropriate left or right ice detector head.

(3) Place a notice near the detector head, warning of the high temperatures the heater can attain.

(4) Make available electrical ground power as detailed in 24-41-00, Servicing.

(5) On roof panel 4-211 ensure that the following switches are set to the OFF position:

(a) The WING & INTAKE ANTI-ICING system MAIN and ALTERN selector switches.

(b) All four ENGINE ANTI-ICING switches.

(6) Trip and fit safety clips to the appropriate circuit breakers listed below.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
Left system			
LH ICE DETECTOR CONT IND & SUP	15-215	1H 101	A12
Right system			
RH ICE DETECTOR CONT IND & SUP	15-216	2H101	B16
Both systems			
ENG 2 ANTI-ICE CONT	15-215	2H1311	B15
ENG 3 ANTI-ICE CONT		3H1311	B16
WING & INT NORM CONT & SUP		1H1836	D10
ENG 1 ANTI-ICE CONT	15-216	1H1311	C10
ENG 4 ANTI-ICE CONT		4H1311	C11
WING & INT ALTN CONT & SUP		2H1386	E14

C. Test system in Ground Configuration

NOTE: The audio warning gong referred to in the following tests is the single-stroke gong, which repeats at intervals of approximately 10 s when activated.

(1) Reset circuit breaker 1H101 (2H101) (Ref. para.B.(6)).

(2) Gain access to shelf 10-215 (10-216) of the flight compartment racking, and identify the relay unit.

NOTE: Operations (3) to (10) inclusive have to be carried out within approximately 3 min.

(3) Press the PRESS TO TEST push-switch on the relay unit for at least 2 s, as the switch is released, start the stopwatch and check that:

(a) The audio warning gong sounds at least once.

(b) The relay unit test lamp is illuminated.

(c) The master warning red ICE caption is illuminated.

(d) On panel 4-211 the left (right) blue ICE caption and the red ICE caption are illuminated.

(4) Check that the relay unit test lamp is extinguished at an elapsed time of 10(±5) s. Continue to measure elapsed time on the stopwatch.

(5) At panel 4-211, set the WING & INTAKE ANTI-ICING - MAIN selector switch to the "4 SECS - ON" position and all four ENGINE ANTI-ICING switches to the "ON" position. Check that:

(a) The red ICE caption on panel 4-211 is extinguished.

(b) The master warning red ICE caption is extinguished.

(c) The audio warning gong ceases to sound.

(6) Set the MAIN selector switch to the "OFF" position and check that:

(a) The audio warning gong sounds at least once.

(b) The master warning red ICE caption is illuminated.

(c) The red ICE caption on panel 4-211 is illuminated.

(7) At panel 4-211 set the WING & INTAKE ANTI-ICING - ALTERN selector switch to the "4 SECS - ON" position. Check that:

(a) The red ICE caption on panel 4-211 is extinguished.

(b) The master warning red ICE caption is extinguished.

(c) The audio warning gong ceases to sound.

(8) Individually operate each ENGINE ANTI-ICING switch, first to the "OFF" position and then to the "ON" position. Check that:

(a) The red ICE caption on panel 4-211 is first illuminated then extinguished.

(b) The master warning red ICE caption is first illuminated
R then extinguished. (Not applicable when LH PRESS TO
R TEST push switch is selected).

(c) The audio warning gong sounds each time a switch is set
R to the OFF position. (Not applicable when LH PRESS TO
R TEST push switch is selected).

(9) Set the ALTERN selector switch and the four ENGINE ANTI-ICING switches to the "OFF" positions. Check that:

(a) The audio warning gong sounds at least once.

(b) The master warning red ICE caption is illuminated.

(c) The red ICE caption on panel 4-211 is illuminated.

(10) Check that at 3 min (±36 s) elapsed time:

(a) The left (right) blue ICE caption and the red ICE caption on panel 4-211 are extinguished.

(b) The master warning red ICE caption is extinguished.

(c) The audio warning gong ceases to sound.

(11) At panel 4-211, press the left (right) blue ICE caption for at least 2 s, as the caption is released start the stopwatch and check that the caption is illuminated. Disregard all other indications.

NOTE: The master and audio warnings may be cancelled by pressing the master warning red ICE caption.

(12) Ensure that, at 3 min (±36 s) elapsed time, the blue ICE caption is extinguished.

D. Test System in Flight Configuration

CAUTION: IN THE FOLLOWING TESTS FULL ELECTRICAL POWER IS APPLIED TO THE DETECTOR HEAD HEATING ELEMENT. THE ASSOCIATED CIRCUIT BREAKER MUST BE TRIPPED IMMEDIATELY THE TEST INDICATIONS HAVE BEEN CHECKED.

NOTE: The audio warning gong referred to in the following tests is the single-stroke gong, which repeats at intervals of approximately 10 s when activated.

(1) Fit the ice detector probe adapter to the left (right) detector head.

(2) Remove the static plug from the associated left (right) static vent.

(3) Set up the bellows unit and water manometer for applying negative pressures and, using a T-connector and flexible tubes, connect them to the probe adapter.

(4) Gain access to shelf 10-215 (10-216) of the flight compartment racking, and identify the relay unit.

(5) Ensure that all services liable to be adversely affected by the tripping of the weight switch circuit breakers are effectively isolated (Ref. 7-11-00), except for the ice detection systems.

(6) Trip and fit a safety clip to the LH UC WEIGHT SW A SYS SUP circuit breaker G292, panel 1-213, map ref. M17 (RH UC WEIGHT SW B SYS SUP, G294, panel 3-213, map ref. B9).

(7) Reset circuit breaker 1H101 (2H101) (Ref. para.B.(6)).

(8) Operate the bellows unit to apply a negative pressure of 2.55 (±0.5) in (65 (±15) mm) water gauge to the system, for 5 s only. Check that:

(a) The relay unit test lamp remains extinguished.

(b) The left (right) blue ICE caption and the red ICE caption on panel 4-211 are illuminated.

(c) The master warning red ICE caption is illuminated.

(d) The audio warning gong sounds at least once.

(9) Immediately the above indications have been checked, trip and fit a safety clip to LH ICE DETECTOR CONT IND & SUP circuit breaker 1H101, panel 15-215, map ref. A12 (RH ICE DETECTOR CONT IND & SUP, 2H101, panel 15-216, map ref. B16). Check that:

(a) The left (right) blue ICE caption and the red ICE caption on panel 4-211 are extinguished.

(b) The master warning red ICE caption is extinguished.

(c) The audio warning gong ceases to sound.

(10) Reset LH UC WEIGHT SW A SYS SUP circuit breaker G292 (RH UC WEIGHT SW B SYS SUP, G294) and reinstate the associated services.

(11) Remove the probe adapter from the detector head and, using caution, check that the head has been heated.

E. Conclusion

(1) Refit the static plug to the static vent.

(2) When the detector head has cooled sufficiently, refit the protective cover.

(3) Remove the warning notice from the vicinity of the detector head.

(4) Switch off and disconnect electrical ground power as detailed in 24-41-00, Servicing.

(5) Reset the circuit breakers tripped before testing.

(6) Refit the panel covers to the flight compartment racking.

4. Manometric Pipelines Purging

A. Equipment and Materials

DESCRIPTION	PART NO.
Torque spanner, 70 to 100 lbf in (0.791 to 1.130 mdaN)	-
Torque spanner, 70 to 120 lbf in (0.791 to 1.356 mdaN)	-
Dry nitrogen, at 10 psig (0.69 bar)	-

B. Prepare

(1) Gain access to the appropriate LH (RH) relay unit by removing the cover from shelf 10-215 (10-216) of the flight compartment racking.

WARNING: THE DETECTOR HEAD MAY BE HOT.

(2) Remove the protective cover from the appropriate LH (RH) detector head and the plug from the associated static vent.

C. Purge

(1) Disconnect each of the flexible pipes from the HEAD and STATIC connections on the LH (RH) relay unit.

(2) Blow through each flexible pipe in turn with the dry nitrogen and ensure that an unobstructed flow is available at the appropriate detector head or static vent.

(3) Check the manometric connectors for cleanliness and freedom from damage.

(4) Identify the flexible static pipe (equipment ident. S03 for the left unit or S02 for the right unit) and connect it to the STATIC connection on the relay unit, torque-tightening the pipe-nut to between 70 and 120 lbf in (0.791 and 1.356 mdaN).

(5) Identify the flexible pitot pipe (equipment ident. P05 for the left unit or P04 for the right unit) and connect it to the HEAD connection on the relay unit, torque-tightening the pipe-nut to between 70 and 100 lbf in (0.791 and 1.130 mdaN).

C. Conclusion

(1) Carry out a Manometric Leak Test (Ref. para.5.).

(2) Wire-lock the torque-tightened pipe-nuts at the relay unit as detailed in 20-21-13.

(3) Refit the cover to the flight compartment racking.

5. Manometric Leak Test

A. Equipment and Materials

DESCRIPTION	PART NO.
Ice detector probe adapter	E925040000
Ice detector static vent adapter	D935041000
Pitot-static test set (Mk.2, Mk.5 or equivalent)	-

B. Prepare

(1) Remove the protective cover from the appropriate left or right ice detector head and the plug from the associated static vent.

(2) Trip and fit a safety clip to the LH ICE DETECTOR CONT IND & SUP circuit breaker 1H101, panel 15-215, map ref. A12 (RH ICE DETECTOR CONT IND & SUP, 2H101, panel 15-216, map ref. B16).

C. Test

(1) Fit the ice detector probe adapter to the left (right) detector head.

(2) Fit the ice detector static vent adapter to the left (right) static vent.

(3) Using a T-connector and flexible tubes, connect the probe and static vent adapters to the static connector of the pitot-static test set.

(4) Adjust the baroscale of the altimeter integral with the test set until the altimeter indicates zero altitude.

(5) Adjust the pressure at the test set until the integral altimeter indicates 32,000 ft (11,700 m).

(6) Allow the pressure to stabilize, then check that the altimeter indication does not fall below 23,000 ft (8,400 m) over a period of 4 min.

(7) Adjust the pressure at the test set until ambient pressure is attained.

(8) Remove the probe and static vent adapters from the detector head and static vent.

D. Conclusion

(1) Refit the protective cover to the detector head and the plug to the static vent.

(2) Reset circuit breaker 1H101 (2H101) (Ref. para.B.(2)).

B E. Detector Head & Relay

B (1) Equipment and Materials

DESCRIPTION	PART NO.
'Bryans' leak tester	-
Ice detector static vent adapter	D935041000
Ice detector probe adapter	E925040000

B (2) Test

B (a) Connect the leak tester to the detector head using adapter E92504000, leave static vent open to atmosphere. Apply positive (pitot) pressure to obtain 350 kts on Bryans tester. Reading should not change more than 3 kts over a 3 minute period.
Release the pressure and remove adapter.

B (b) Detector Head only. Connect the leak tester to the static vent using adapter D935041000, leave detector head open to atmosphere. Apply negative (static) pressure to obtain a reading of 350 kts on Bryans tester. Reading should not change more than 3 kts over a 3 minute period.
Release the pressure and remove adapter.

B CAUTION: DO NOT APPLY NEGATIVE PRESSURE TO THE DETECTOR HEAD.

ICE DETECTOR RELAY UNIT - REMOVAL/INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

Two ice detector relay units are mounted in Elfin cases in the flight compartment racking, one unit for the left system on shelf 10-215, the other for the right system on shelf 10-216.

The relay units are secured to the Elfin cases with captive screws and connected to associated manometric pipelines by flexible hoses.

2. Relay Unit

A. Equipment and Materials

R

DESCRIPTION	PART NO.
Circuit breaker safety clips	-
Torque spanner, 70 to 100 lbf in (0.791 to 1.130 mdaN)	-
Torque spanner, 70 to 120 lbf in (0.791 to 1.356 mdaN)	-

R
R

B. Prepare

R R R R (1) Trip and fit a safety clip to LH ICE DETECTOR CONT, IND & SUP circuit breaker 1H101, panel 15-215, map ref.A12 for the left unit or RH ICE DETECTOR CONT, IND & SUP circuit breaker 2H101, panel 15-216, map ref.B16 for the right unit.

(2) Remove the appropriate cover from the LH or RH racking and identify the unit to be removed.

C. Remove

R (1) Disconnect each of the manometric pipelines from the HEAD and STATIC connections on the relay unit.

(2) Fit suitable blanks to the flexible hoses and the connectors on the relay unit, then stow

the hoses in the pillar recess.

(3) Unscrew fully the four screws securing the relay unit to the Elfin case assembly. Withdraw the unit.

NOTE: The screws also act as extractors, therefore progressive unscrewing action on each screw in turn is required.

D. Install

(1) Comply with the electrical safety precautions.

(2) Check the electrical and manometric connectors for cleanliness and freedom from damage.

(3) Slide the relay unit into the appropriate Elfin case assembly. Ensure that the electrical connectors are correctly aligned, then secure the unit with the four captive screws.

(4) Identify the flexible static pipe (equipment ident.S03 for the left unit or S02 for the right unit) and connect it to the STATIC connection on the relay unit, torque-tightening the pipe-nut to between 70 and 120 lbf in (0.791 and 1.356 mdaN).

(5) Identify the flexible pitot pipe (equipment ident.P05 for the left unit or P04 for the right unit) and connect it to the HEAD connection on the relay unit, torque-tightening the pipe-nut to between 70 and 100 lbf in (0.791 and 1.130 mdaN).

(6) Wire-lock the torque-tightened nuts as detailed in 20-21-13.

(7) Ensure that the relay unit is satisfactorily bonded in accordance with 20-27-11.

R B (8) Carry out a leak test in accordance with 30-81-00,
R B Adjustment/Test, para.5.E., Detector Head and Relay.

E. Conclusion

(1) Reset the circuit breaker tripped before removal.

(2) Carry out an Operational Test of the associated left or right ice detection system as detailed in 30-81-00.

(3) Refit the cover to the flight compartment racking.

ICE DETECTOR HEAD - REMOVAL INSTALLATION

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

1. General

This topic details the removal and installation of the left-hand and right-hand ice detector heads, located on the forward fuselage below the flight compartment side windows.

2. Detector Head (Ref. Fig. 401)

A. Equipment and Materials

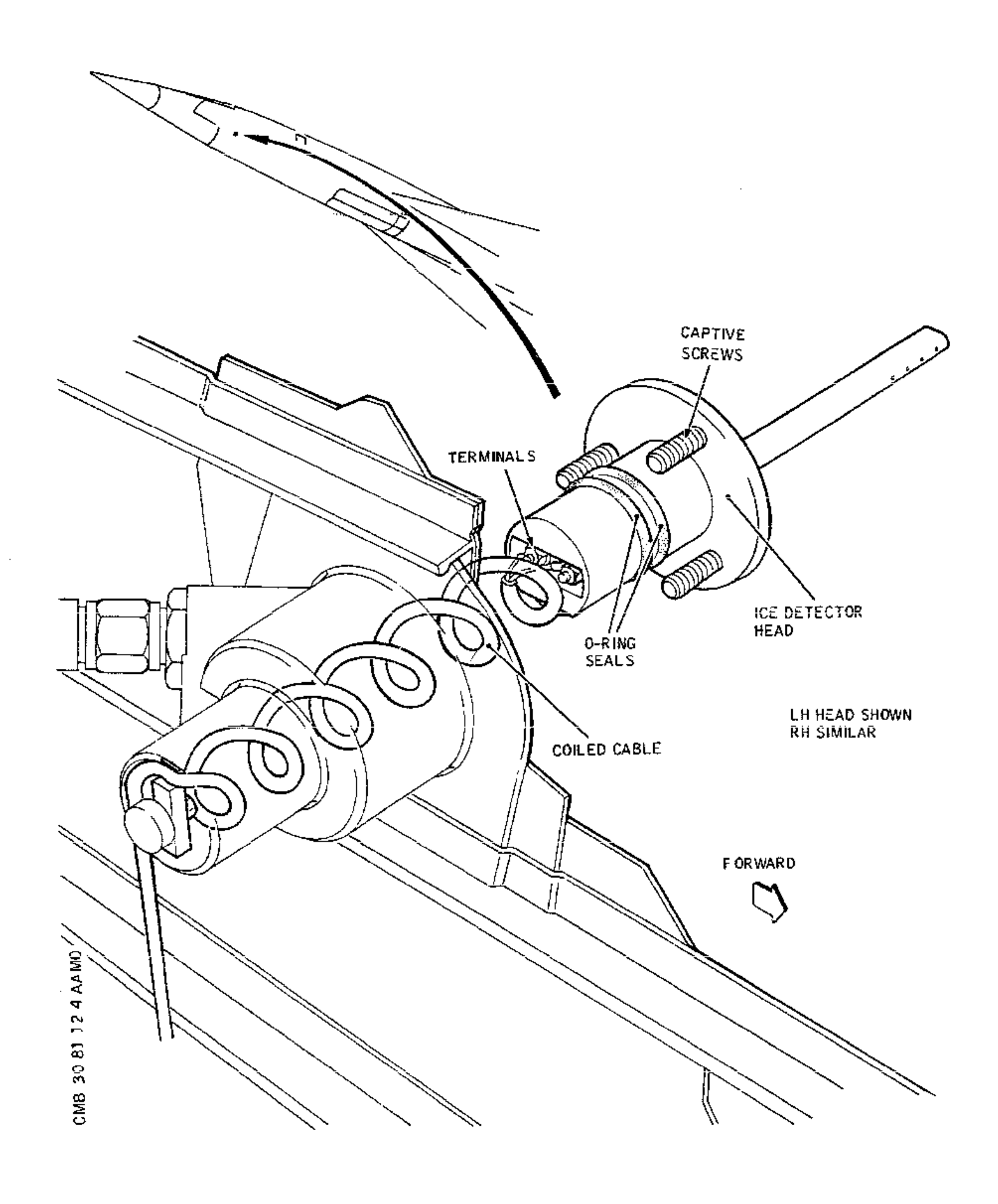
DESCRIPTION	PART NO.
Circuit breaker safety clip	-
Torque spanner, 6 to 6.5 lbf in (0.0680 to 0.0735 mdaN).	-
R Colubleum M.O. light grease R (Ref. 20-30-00, No.078) R	-

B. Prepare

(1) Trip the appropriate LH or RH circuit breaker and fit a safety clip.

SERVICE	PANEL	CIRCUIT BREAKER	MAP REF.
LH ICE DETECTOR CONT IND & SUP	15-215	1H101	A12
RH ICE DETECTOR CONT IND & SUP	15-216	2H101	B16

C. Remove



R

Ice Detector Head - Installation
Figure 401

WARNING: THE PROBE MAY BE HOT.

(1) Progressively unscrew the three detector head retaining screws.

(2) Carefully withdraw the detector head, ensuring that the coiled electrical cable is not strained; support the detector head.

(3) Remove the potting compound from the detector head terminal connections and disconnect the electrical cables.

NOTE: If a replacement head is not being fitted immediately, insert the coiled cable into the housing and fit a suitable blank.

D. Install

(1) Comply with the electrical safety precautions.

(2) If applicable, remove the blank from the detector head housing.

(3) Inspect the O-ring seals fitted to the detector
R head body; renew as necessary. Lubricate the O-ring
R seals with Colubleum grease before assembling the
R detector head to its housing.

(4) Connect the electrical cables to the detector head, ensuring that the connections are made in accordance with the cable identifications and the applicable wiring diagram; torque-tighten the terminal nuts to between 6 and 6.5 lbf in (0.0680 and 0.0735 mdaN).

(5) Apply potting compound to the detector head terminal connections in accordance with 20-27-13, Method B, to a depth not exceeding 0.10 in (2.54 mm) above the terminals.

R (6) Ensure that the four holes in the leading edge of the
R probe are facing forward, then insert the coiled
R cable and detector head into the housing.

(7) Secure the detector head with the three retaining screws, progressively tightening the screws to obtain an even fitting.

(8) Check that the detector head is bonded in accordance with 20-27-11.

E. Conclusion

(1) Carry out a Manometric Leak Test on the appropriate
R ice detection system (Ref. 30-81-00, Adjustment/Test).

(2) Remove the safety clip and reset the circuit breaker tripped before removal.

(3) Carry out an Operational Test of the appropriate
R ice detection system (Ref. 30-81-00, Adjustment/Test).

ICE DETECTOR HEAD - INSPECTION/CHECK

WARNING: OBSERVE THE ELECTRICAL SAFETY PRECAUTIONS DETAILED IN 24-00-00.

THE DETECTOR HEAD MAY BE VERY HOT.

CAUTION: BEFORE UNBLOCKING PRESSURE SENSING HOLES, TRIP THE ASSOCIATED CIRCUIT BREAKER (REF.30-81-12, REMOVAL/ INSTALLATION).

1. General

The detector heads are located one on each side of the aircraft, below the flight compartment side windows.

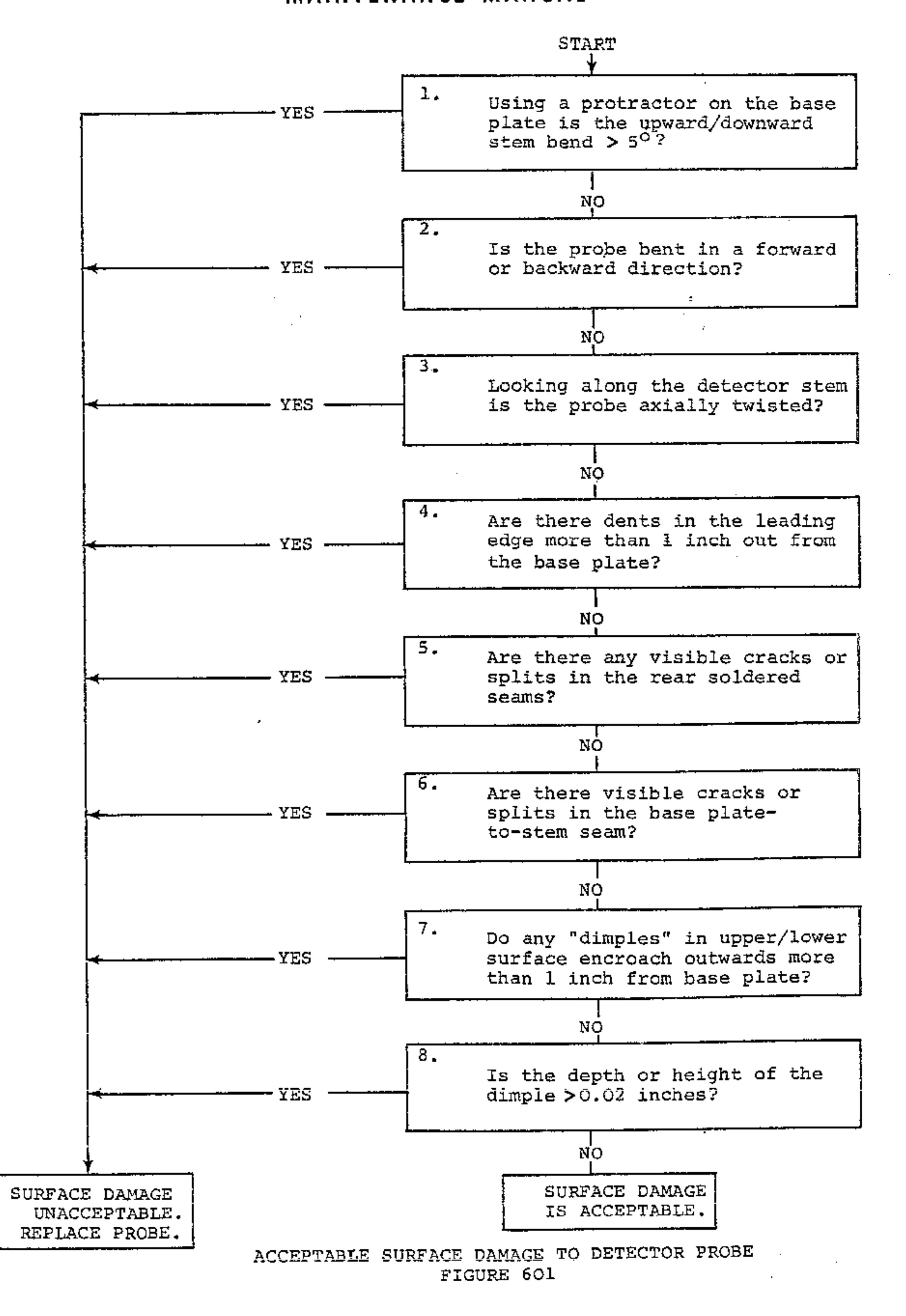
2. Inspection/Check

(1) Check that the six pressure sensing holes, i.e., four on the leading edge and two on the trailing edge, are not obstructed.

NOTE: Obstructions in pressure sensing holes may be cleared with a soft metal probe. However, extreme care must be taken not to enlarge the holes.

R B 3. Acceptable Surface Damage to Detector Probe (Ref. Fig.601)

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ACCEPTABLE SURFACE DAMAGE TO DETECTOR PROBE
FIGURE 601

END OF THIS SECTION

NEXT